# DOW JONES

# PETER JONES



A HISTORY OF THE DOW JONES STOCK AVERAGES SINCE 1884

# DOW JONES BY PETER JONES

The stories behind the first companies that formed the Dow Jones Average in 1884 as told by their stock certificates. And the stories behind the companies that formed the industrial average when it went from 11 stocks to 12 stocks in 1896, then to 20 stocks in 1916 then to 30 stocks in 1928. And finally, the longest-lasting 30 stocks in the average and the 10 largest stocks today. Their stories are all illustrated by a collection of the securities from each company.

By Peter D Jones, MA, MD, MBA

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# **Preface**

For many years I collected coins, then I started collecting paper money. All that time, one of my enduring interests was financial history. Before I moved sideways into paper money, someone once said to me "when are you going to stop collecting those little round things, and start with the big oblong ones". There is more real estate on a banknote than a coin, and there is more real estate still on a stock certificate.

Both bank notes and securities often have small vignettes. A lot of American stock certificates are engraved by famous American engravers working for engraving companies like the American Bank Note Company. The ability to create an image out of a series of lines scribed into a steel plate is truly incredible. But today it is almost a lost art.

Stock and bond certificates are much cheaper to collect than currency and coins as there are fewer collectors. At the beginning a good plan seemed to be to collect the stocks of the Dow. But how to collect? I hit upon the idea of collecting the stock certificates that composed the Dow Jones average on the year that each new average was created.

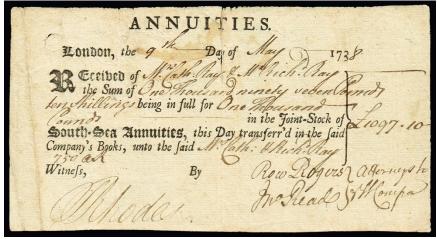
The more modern companies like Facebook do not issue stock certificates. In times past companies recorded on paper what you owned, and made it near impossible to copy. They recorded it in a central repository. That system worked well for hundreds of years. The first bearer bonds were supposedly 1,700 BCE in Mesopotamia. The first shares were "temple days" 2,000 BCE in Mesopotamia. An investor could buy one temple day. They received a clay tablet entitling the holder to all the temple income for one day.

In 1611 entrepreneurs founded the Amsterdam stock exchange. Most of its business was the Dutch East India Company or VOC (Vereenigde Oost-Indische Compagnie) founded in 1602. The Dutch West India Company was founded in 1621.

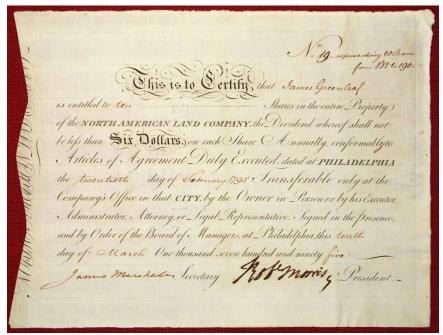
The oldest American stock certificate I have is Robert Morris's North American Land Company. Morris became the wealthiest man in America and financed much of the American Revolution. But his Land Company bankrupted him.

Of course the paper system worked well until the advent of computers. Today everything is registered on computers. Modern companies no longer issue stock certificates. However, uniquestockgift.com is one company who still issue single share frameable stock certificates for individuals for current publicly traded companies.

I write this to put together a book so that my family has a record explaining why I spent so much time on seemingly bizarre pursuits.



1738 South Sea Company Stock Annuity transfer, the oldest security I own, relating to the New World.



Morris issued 10 shares for his North American Land Company dated 1795

# **Forword**

# Dow Jones A History of Dow Jones Stock Averages Since 1884

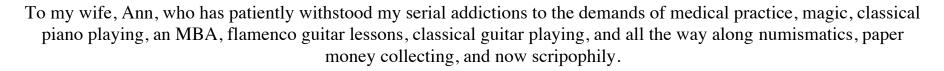
Vintage stocks and bonds are mementos of our financial history, tickets to the past. The journey they provide is an education in the business world in the United States as it has developed over the last 200 years - an education in technology, business practices, money, politics, personalities, entrepreneurship and all the many influences on our business enterprises over the years. Peter focuses in this work on the key mementos of American business: The indexes, in particular the Dow Jones Indexes.

Peter is a throw-back, really a bit of a Renaissance Man. Or he has had two or three lifetimes operating in parallel. One of his hobbies is magic, and that must be how he found the time to write this book along with his busy medical practice and a wealth of other hobbies and projects — classical piano, classical guitar and flamenco, magic, numismatics, paper money collecting, writing books (*Notable Notes*, on large size US currency, and *Commemorative Coin* Tales) and, incidentally, a management MBA in his spare time. It may be that having such broad interests facilitated the discovery of the Dow Index component company stories. It's been critical to have an open and inquiring mind, but also one that is able to focus on the details, and in this Peter has succeeded.

We all know the "Dow Jones." But that like we know many things that are part of the background of modern life. The Dow Jones is so ubiquitous we can't go through a news day without hearing about it, but we really aren't all that knowledgeable about its history and how it works. Be prepared to sit back and learn all about this icon of American finance – the needs that gave it birth, early years, its changes and permutations, and the categories and ebb and flow of the component companies of the Index variations. Did you know the DJ started out with only 10 major railroads and Western Union? It took 12 more years to introduce the "Industrials". This extremely well researched book, copiously illustrated with graphically spectacular securities, will bring the "DJ" to life for you. Enjoy!

Max Hensley Chief Editor, Scripophily US Chapter President, International Bond and Share Society

# **DEDICATION**



To my three daughters, violinist Ashley, architect Rebecca and photographer Alexandra, who have put up with the same.

To the ANA – an important organization that has fostered my lasting interest in financial history. They are the prime organization for numismatic education.

President Calvin Coolidge was supposed to have said, "the business of America is business" in a January 1925 speech to newspaper editors. What he actually said was, "the chief business of the American people is business".

# **CHAPTER ONE. Scripophily – what is it?**

It is estimated that there are about 50,000 dabblers in stock certificates in the world. There are probably over 50-100 dealers, and 20 auction houses.

Scripophily is a specialized field of numismatics which involves collecting stocks, bonds, and other financial paper artifacts. The following shows how it fits into the wider field of numismatics:

```
Numismatics—solid —coins
—exonumia—tokens and medals
—other e.g. elongated cents, wooden nickels
—paper—paper money (syngraphy)
—exographia—securities (scripophily)
—other e.g. scrip, checks,
```

# The development of numismatics and birth of scripophily from numismatics.

Many famous people collected coins: Augustus Caesar, Petrarch, several Popes, Lorenzo de Medici, Louis XIV, George III, Thomas Jefferson, John Quincy Adams, Tolstoy, Enrico Caruso and King Farouk. Hence the appellation "Hobby of Kings". King Victor Emanuel of Italy wrote a 20-volume book on Italian numismatics. Wayne Gretzky, James Earl Jones, and Nicole Kidman are contemporary numismatists.

Joseph Eckhel wrote *Doctrina Numorum Veterum* the first academic study of ancient coins in an eight-volume work from 1793 to 1799. This established numismatics as an academic subject in Europe. European Universities then established chairs of numismatics. In America there are no university departments of numismatics. The American Numismatic Association grants a diploma in numismatics, but this would only be equivalent to several university credits and is by no means a degree.

Some collectors have an interest in financial history and scripophily certainly fits the bill here. After the American Civil War (1861-1865) people started collecting Confederate States of America (CSA) currency and bonds. They were the first bond collectors. In 1880 Capt. Raphael Thian published *Register of Confederate Debt* which included lists of CSA bonds. In 1961 Grover Criswell published a book on CSA currency which also listed CSA bonds.

Almost half a century ago in the 1970s, the number of collectors of securities reached a critical mass, perhaps fostered by an interest in financial history and art. The International Bond and Share Society (IBBS) started in 1978 after the word "scripophily" was coined. *Scrip* means financial ownership, and *philos* means love of. The IBSS publishes the magazine *Scripophily* several times a year.

IBSS lists on their website, scripophily.org, over 40 dealers, 22 auction houses and around 170 books on scripophily on their website. They estimate around 40,000 collectors today. Worldwide auction sales and eBay sales of scripophily material were \$6 million in 2018. Dealers offered 200,000 lots, with a sell through rate of 50% at auction and 35% on eBay. The largest interest is in US and Germany. (Germany is surprising because German stock certificates are typically artistically unappealing.)

Standard and Poor, and Moody have published manuals on US companies. Stock Exchanges have also published yearbooks, directories, and registers of companies now out of business. The Dictionary of American Biography also publishes information about US companies. The internet is rich with information about old companies and financial history. Some companies used to pay professional historians to document their history, but this seems less common these days.

Scripophily attracts those interested in history, especially financial and corporate history, but also government history. Many art nouveau certificates make excellent framed pictures. Scripophily is a hobby, not an investment. Although items create a store of value, future prices are unpredictable.

Scripophily today includes several types of securities: stocks, bonds, promissory notes, indentures, bills of exchange, and other financial paper artifacts. Scripophily can blend into autograph collecting (philography).

## **History of scripophily.**

In 900s in Amalfi, Italy, entrepreneurs promoted sailing ventures with tradable shares. This was later a common practice in Venice. The earliest incorporated joint stock company was Stora Kopparberg Berslag, a Swedish copper mine, in 1347.

The earliest collectible scripophily pieces are from the 1600s. They were typically just small signed printed bits of paper serving as receipts. By the 1700s decorative pieces were printed often on vellum. The earliest US pieces were from the 1790s. In the 1800s engraved vignettes made railroad stocks a popular item. Before 1850 most pieces were black and white. Chromolithography, a printing process, was invented in the 1850s, which added colors to securities.

England remained quite conservative, eschewing artistry on most of their pieces. In the 1850s steel plate engraving started to displace copper plate engraving enabling high volume printing. Companies could have a custom designed certificate with expensive detailed vignettes. Or they could choose a generic design from a printer's proof book, to which they could add their company's name. This was much cheaper than a custom certificate.

Gene Hessler lays out the history of engraving in America in his book *The Engraver's Line*.

Elaborate borders became a reality with geometric lathe work, an anticounterfeiting device. Siderographers could combine different designs on a steel plate with enormous skill. Their occupation has now died out, but at one time they were second only to the great engravers.

Art Nouveau (called Jugendstil in Germany) started in the 1890s lasting until the First World War (1914-1918). Alfons Mucha, a Czech, was a prominent proponent. After the First World War, a new movement, Art Deco, started. This lasted 10-15 years. You can find Art Nouveau and Art Deco designs on securities.

### Where do old securities come from?

Stocks and bonds are supposed to be destroyed once redeemed, so where do they come from? Some people never redeemed their stocks or bonds so they still exist. Some were redeemed and given to shredding companies who illicitly resold them as collectibles. Others were specimens made by printers to show companies how the certificates would look – companies often kept these as a sample which they may have stored in their archives. Printers like the American Bank Note Company kept others.

The Pennsylvania Central Railroad Company in the 1980s decided, instead of shredding its archived certificates, to sell them to scripophily dealers. In 1987 a London bank discovered a hoard of 80,000 useless CSA bonds which were sold to dealers who in turn sold them to collectors. Nevertheless, it is surprising to me that so many certificates are available today, and that I have been able to assemble an almost complete set of the "Dow Top Dogs". Modern companies like Facebook do not produce paper stock certificates. Thus, many of the current DJIA (Dow Jones Industrial Average) stocks are not available as paper certificates.

So, if you like scripophily what can you collect? Here is a list of collectible areas:

- Art on securities in the 1800s and the 1900s, Art Nouveau, Art Deco, Mucha securities, artistic securities, etc.
- Vignettes by specific engraving companies or individual engravers e.g. American Bank Note Company.
- Specific industries e.g. railroads, autos, mining, aviation, telecommunications.
- Specific countries e.g. US, German, British, World, or one from each country in the world
- Securities related to historical events e.g. American Revolutionary securities (William Anderson has written a book on this called *The Price of Liberty*). Examples of other events are the South Sea Bubble, the

Californian gold rush, the American Civil War (CSA bonds) and John Law's Mississippi Company.

- Dow-Jones companies in America the subject of this book.
- Autographs of famous people and businessmen.
- Scams and scandals

Each year there was a scripophily show at the Museum of American Finance in New York City, complete with a floor auction and dealers. The museum itself had a beautiful display of the history of American Finance including scripophily items, US bank notes and the Hamilton room. Alexander Hamilton was the genius of American revolutionary finance. The room was a federalist style recreation of Hamilton's private room at the Bank of New York (which he founded). But in January 2018, a main water pipe burst, flooding the museum. The collection is safe but they are still looking for a new building to lease as of March 2019. Each year in January is the Hendon, Virginia, Annual Scripophily Show.

Anyone interested should join the IBSS. Their magazine *Scripophily* discusses world auctions and has interesting articles on various stocks and bonds. IBSS has published it several times a year since 1978. Scripophily auction companies usually have a sell through rate around 50% (i.e. only 50% of their items sell). They set their prices with a minimum starting price. While many numismatic auction companies have now low-balled their estimates to stimulate bidding this is not the case with scripophily items. So, unless you are absolutely desperate for a piece, a 10-20% bid above starting price is quite likely to land you the piece.

Internet dealers often markedly overprice their offerings. So, if you want a \$10 - \$20 item it may save you the hassle just to pay for it. But for anything more expensive, scour the auctions and shows. eBay has many items, some selling very reasonably, others selling very unreasonably. Nevertheless, scripophily dealers are a service to us and need to make a living, so I feel we, as collectors, need to align our desires with theirs.

When it comes time to sell, scripophily items are not as fungible as slabbed, high-turnover coins. With only 20+ auction houses with low "sell-through" rates, one should not expect a killing. This is a hobby not an investment!

A quote I once heard from Rolls Royce was that design, materials and workmanship create value. This is an admirable start to determining values of certificates. But one has to add a few more criteria – antiquity, desirability (a sister of marketing), rarity, beauty (vignettes are very important) and historical significance.

The main securities are stock and bonds. Stocks represent equity i.e. ownership in a company. Bonds represent debt i.e. lending money to a company. Below is a list of definitions:

•

#### **Bonds**

- Corporate bonds may be secured or unsecured. Secured means that stated assets back the bonds.
- A debenture is an unsecured bond with no specific backing, just faith that the company will pay you back.
- A mortgage bond is a group of repackaged mortgages. For example, a thousand homeowners each take a mortgage of \$100,000 at 5%. The mortgage company holding these mortgages worth \$100 million can sell them all to a bank. The bank in turn can issue bonds to the public for \$100 million paying them 4% interest, and pocketing 1%. Changing mortgages into securities is called securitization.
- A gold bond meant they paid interest and capital in gold money.
- Governments as well as companies can issue bonds. Government bonds
  are more highly rated as most investors feel the full faith and credit of
  the federal government backs the bond. State bonds are quite secure but
  the territory of Puerto Rico defaulted on their bonds in 2016.

#### **Stock Certificates**

- Ordinary shares (= common stock). Companies pay these off last after preferred shareholders and bonds in the case of a company's liquidation.
   Ordinary shares usually pay dividends. Share owners can vote for company directors and attend annual shareholder meetings.
- Preferred shares. Companies pay these off after bondholders but before common stockholders in case of a company's liquidation. Companies usually pay the dividends at a fixed percentage of the par value. The par value is the value of the preferred stock as issued, typically written on the certificate. Preferred shareholders cannot vote for directors or attend annual shareholder meetings. Some preferred shares called convertibles can be converted into ordinary shares.
- Deferred dividends. Companies only pay dividends if there is enough money left after they pay preferred shareholders' dividends. If they cannot pay preferred shareholders, the dividends may be deferred.
- Inscribed stock. In UK in 1700s they did not issue stock certificates.
   Instead they entered the owner's name and stock into a register and only gave the owner a receipt for the money. The collectible here is the receipt for stock, but is not very exciting, just writing on a scrap of paper.
- Endorsed stock certificate. This encompasses anything written or printed on the back of the stock certificate.
- Assessable stocks. In 1700s and 1800s you could buy stock by making a down payment e.g. of 10%. The company would then later charge you for further increments as the company developed. This created difficulties. For example, some stock buyers could not come up with the money. Stockholders also disliked later bills. So, most stock sold since the late 1800s has been non-assessable.
- Registered stock (= Nominative stock). This means the stock certificate had the owner's name written on it. If there was no name it was called a bearer certificate. "Registered" was like a check, "bearer" was like cash.

#### **Properties of Securities.**

- 1. Company name.
- 2. Who they issued the security to. They may have issued it to specific person (nominative or registered) or no name entered (e.g. specimen certificate) or a bearer certificate.
- 3. Normal or specimen certificates. Normal certificates are usually cancelled, but may be uncancelled. A specimen certificate typically has all zeros for their serial numbers, no name filled in, is uncancelled and is often uncirculated. There are often no officer's signatures. Sometimes it is stamped with the word SPECIMEN. Printing companies gave these to companies so they could see what the certificate would look like before issue.
- 4. Number of shares for stock, or number of dollars for a bond (in which case percentage interest and terms are listed).
- 5. Date of issue of the certificate.
- 6. State of incorporation.
- 7. Grade. Good means a certificate that looks terrible. Bits are missing, there may be tears into the design or discoloration. The paper is very limp with many folds. Very Good certificates may have stains, a lot of wear, small margin tears, but some eye appeal. Fine certificates have many folds, minor discoloration, and a few minor edge tears, and light writing. Most collectible certificates will be Very Fine. The paper is still crisp, not floppy, but a number of folds are present, which may start to separate at the margin. Extra Fine certificates will have few folds; have original crispness, and no tears. Uncirculated certificates are as delivered to the holder. This means that if the certificate was folded to fit it in a mailing envelope, it is still technically uncirculated. Also, the certificate may include a pinhole as certificates were often pinned together. But the paper will be crisp and unmarked, with no extra folds.
- 8. Certificate number. CUSIP number is a nine-digit alphanumeric code on certificates since the 1960s. CUSIP stands for Committee on Uniform Security Identification Procedures. It is a government database of security issuers.
- 9. Coupons for a bond. These may be underneath the bond, bound to the bond, or by the side of bond or absent.
- 10. Printer e.g. American Bank Note Company. There are three types of printing seen on certificates. Lithography is ink transferred from a printing stone. Intaglio is thick ink raised above the level of the paper deposited from an engraved printing plate. Letterpress is ink impressed into the paper, usually seen with numbering, creating a dent (called embossing) in the paper seen from the other side.
- 11. Signatures of the corporate officers, in the 1800s often the original signature, but on modern certificates a facsimile of the signature.
- 12. Design and vignettes. Frequently seen on medals, and occasionally on other numismatic items are: Delixit Latin for he designed or drew. Sculpsit or sculpt. is Latin for he sculpted. Fecit is Latin for he made, and Lith. is an abbreviation for Lithographer.

- 13. Any security may have tax stamps affixed to show that the issuer has paid the requisite tax to the government. Some people collect by these stamps.
- 14. The seal was originally an embossing of the certificate, or something stuck on the certificate to certify the company issued it. This often included the date of incorporation and the state of incorporation. In the 1900s printing companies usually printed the seal as part of the certificate rather than embossing or adding it.
- 15. Stub. Old stocks were from books with certificates. Each certificate was torn from the book. On the stub they recorded investor information (name, date, number of shares). When they redeemed the stock, they often pasted it back into the old book. Sometimes people disassembled old books to provide stock certificates for collectors, and these stock certificates may come glued to their stubs.
- 16. Cancelled or uncancelled. There are many types of cancellation.

**Pen cancellation** means a pen stroke through the certificate or signatures, or the written word cancelled.

**Punch cancelled** means lots of tiny holes that spell a word e.g. CANCELLED or a date e.g. 5-24-17. When you hold it up to the light you can see easily what it spells.

**Hole cancelled**. The holes may be small and created by a roller in a line, or larger disfiguring holes of various shapes.

Cut cancelled means cuts on the paper, sometimes cross shaped.

**Cut out cancelled** means large bits of the certificate are missing e.g. an edge cut off diagonally, or a square below, etc.

**Stamp cancellation** is done with a rubber inked pad saying cancelled.

# **Types of Cancellation.**



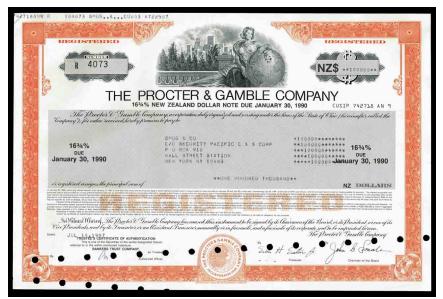
**Pen cancellation** through Flagler's and Rockefeller's name, also Cancelled is written.



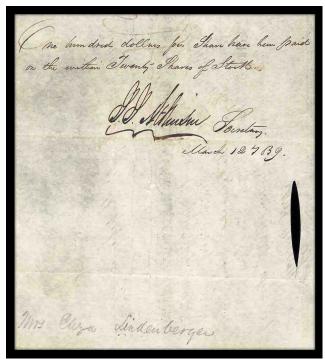
<u>Punch cancellation</u> with a pin punch, tiny holes spell letters and numbers bottom left and right side of certificate. Right reads: "FN +1+8 64 C"



<u>Hole cancelled</u>, note the canceller in this case was careful to put holes over the certificate numbers and signature areas. Holes can be large, small, round, rectangular, star-shaped, or combinations, etc.



Hole cancelled with a rolling puncher.



Cut out cancel right on Baltimore and Ohio Railroad 1837 stock certificate endorsed on back. Cut out cancels can be round, rectangular, diagonal or triangular edge cut, etc.



Stamp cancelled bottom right (note hole cancel left border also).



<u>Typical specimen certificate</u>. Note hole cancellations, stamped with SPECIMEN, and serial number 00000, and no treasurer or vice president signature, all to ensure certificate is not used.

#### **Buying historic securities.**

A related magazine to Scripophily is Financial History, published by the Museum of American Finance, formerly the museum of American Financial History.

Scripophily items may be bought from dealers, eBay, paper shows, scripophily shows, and auctions.

To determine value of scripophily items, vignettes are very important. People may seek an attractive large vignette. However, if thousands are known, this will not increase the its value much. The other criteria of value still hold, i.e. design, materials, workmanship, beauty, historical value, rarity, antiquity, marketing and desirability. Although condition grade may be very important for coin collectors, for scripophily items it is much less important. People will pay more for a nicer example of something, but they will not pay that much more.

There are several catalogues that list scripophily items and their values, though they are not very complete, and you will often come across non-listed items. If you come across items not listed, that does not mean the item is fake.

#### How Companies work.

Let us assume you own a company, the simple equation for ownership is:

<u>Assets</u> of your company minus <u>Liabilities</u> = <u>Owner's Equity</u>.

For example, <u>machinery plus building</u> minus <u>loans</u> = <u>Owner's equity</u>.

**Assets** include a host of things like machinery, buildings, inventory, cash and can include intangible assets like patents, market share, product recognition etc.

Liabilities may include accounts payable, pensions owed, preferred shares, bonds, loans etc.

Owner's Equity means a financial interest in the company.

If you, or a few of you, own a company then you own all the owner's equity in the company. This is a closely held company. If you decide to get really big you could "go public". This would mean issuing stock in your company for the public to buy. You could have an initial public offering (IPO) to float new shares in your company. This would decrease your personal equity. But it would increase cash available to develop the company further.

You decide how many shares you want to give to yourself as the original owner of the company. Typically, one would calculate this based on the current market value of the company. Obviously if you hogged all the shares, the public would not be keen to buy your stock. And if you sold most of the value of the company in the shares, with very little for yourself, the shares would be worth more, so you would get more from the IPO to operate your company.

A company has two major ways to raise cash beyond selling more product. It can raise cash by issuing shares in the company (but if the company is already a public company with shares, issuing more shares would dilute ownership and make existing shares worth less). Or a company can issue bonds, which means the company has to pay back those bonds at a later date plus interest. If you or your company are wealthy enough, you can buy back shares from the public, making the rest of your shares more valuable, and giving yourself more control.

The capitalization of a company is the value of all its shares. For example, if a company issues forty thousand shares of \$25 it is then capitalized at  $40,000 \times $25 = $1$  million. If the shares rise to \$50 in the stock market, then the capitalization rises to \$2 million. This does not mean the company would get \$2 million if they sold all their assets. That is a different figure called the book value. Just because tangible assets may be worth less does not mean the capitalization is wrong. Capitalization reflects what the shareholders think the company is worth in terms of how much the company can earn.

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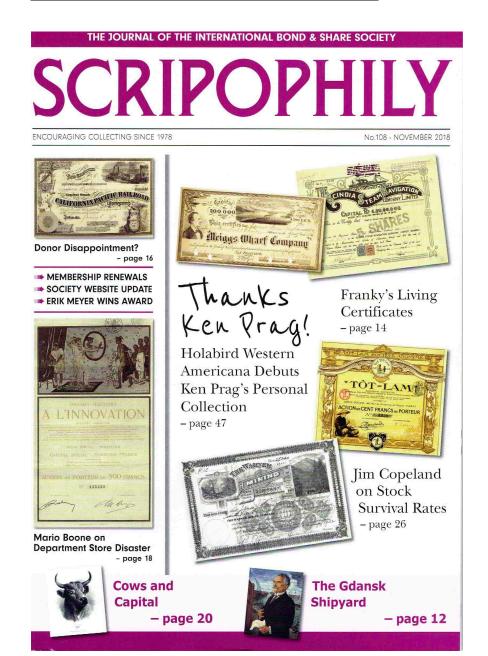
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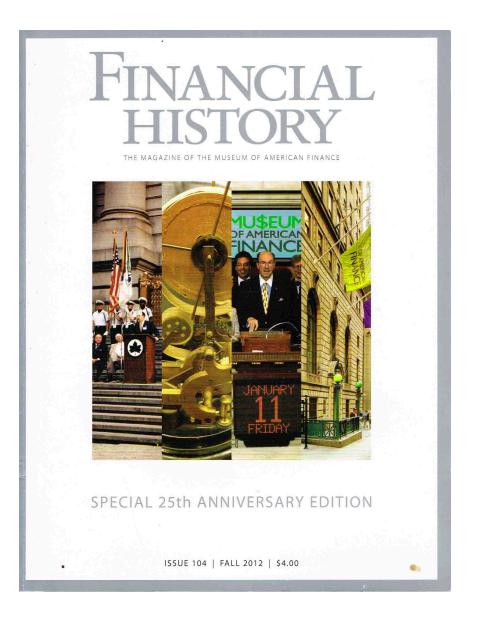
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# Two magazines of interest to Scripophily collectors





# **CHAPTER TWO**

# The Dow Jones Company and its Averages

Charles Dow (1851-1902) was a journalist who, with Edward Jones, founded the Wall Street Journal (WSJ) and Dow Jones & Company.

Dow came from a poor farming family in rural Sterling, Connecticut. At the age of 21 he joined the Springfield Daily Republican, a newspaper in Massachusetts, as a city reporter. He transferred to the Providence Star, then the Providence Journal as a business writer. Renowned as a prominent early technical stock analyst, he published carefully researched books on local businesses.

Dow's editor at the Providence Journal, G.W. Danielson, sent him to Leadville, Colorado, to report on the silver mining craze in 1879. On the train journey Dow interviewed many successful businessmen and later wrote nine "Leadville Letters" based on his analysis. This was his early education as a financial reporter.

In 1880 when he was 29, Dow moved to New York City to work for Kiernan Wall Street Financial News Bureau. He asked a fellow reporter, Edward Jones from Providence, to join him. Jones had dropped out of Brown University but was a skilled stock analyst and statistician. In 1882 Dow and Jones left their employers to set up an independent firm doing the same thing. Incorruptibility became their claim to fame and led to success.

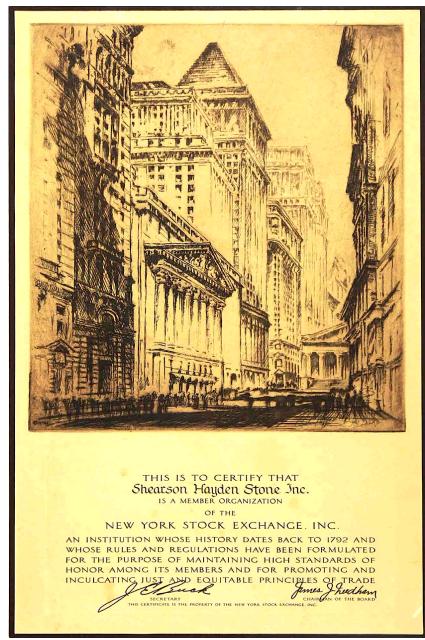
A third silent partner joined them, Charles Bergstresser, who managed company finances and employees. He was also the cousin of Charles Dow's wife.

A year later in 1883, Dow Jones & Co published the "Customer's Afternoon Letter", a two-page summary of financial news. They added the Dow Jones Transport Average (DJTA) (also called the Dow Jones Railroad Average) in 1884. The average started at 40.94. The DJTA comprised eleven stocks: nine railroad stocks, Western Union and Pacific Mail Steamship.

In 1885 Dow became a member of the New York Stock Exchange (NYSE). He seldom traded and only took the seat on the stock exchange as a favor to a friend with immigration problems. Opposite is a NYSE member certificate.

With a staff of 50 by 1889, the Customer's Afternoon Letter grew into the Wall Street Journal (WSJ). It sold for two cents a day. They wanted no one to influence them, so they refused advertising. No one could buy Dow's reporters. If a public company would not give out profit or loss information, Dow said so. They had correspondents and telegraph connections all over the country.

In 1896 Dow added the first industrial stock average, the Dow Jones Industrial Average (DJIA) with 12 stocks. Dow theorized a mathematical relationship between stock market trends and business trends. He also showed the DJIA and DJTA were correlated.



NYSE member Certificate (a seat cost \$3.25 million in 2005!)



Dow Jones & Company Specimen Stock Certificate, hole and stamp cancelled #



Dow Jones Stock Certificate vignette.

#### **About the Vignette**

The vignette shows a female allegory with her attributes, a caduceus, globe and paper. This represents journalism. A city is in the background. The caduceus is the herald's wand of Hermes, the messenger god. (This is often mistaken for the medical symbol also called a caduceus. The proper medical symbol has a single snake and should be called the rod of Asclepius. During the First World War, the US Ambulance Corps introduced the error with two snakes instead of one on the rod. People have perpetuated the error ever since!)

John Hay, (1908-1989) engraved this vignette. He studied mechanical engineering at London, then art at the Royal Canadian Academy of Fine Arts. After a five-year apprenticeship with the Canadian Bank Note Company, he moved to Larchmont, NY to engrave for the American Bank Note Company (ABNCo). There he engraved this vignette for Dow Jones & Co. They also used the same vignette for the US Shoe Corporation in 1956! Hay invented an armored tank periscope that saved many lives. He also studied the occult, and published the magazine Individual Thinker.

Back to the Dow Jones! In 1898 WSJ published a morning edition. They added general news and editorial opinions not just financial news. A year later Jones retired. Three years later Dow became ill with heart disease, and Bergstresser wanted to retire too. So, they sold their company to Clarence Barron, their Boston correspondent, for \$130,000. At year's end Dow died from a heart attack.

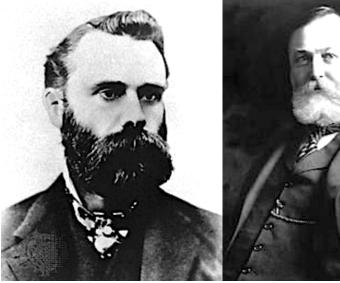
Clarence Barron was a flamboyant eccentric, but a journalistic genius. In 1921 he hired journalist Casey Hogate. And with Barron's son-in-law, Hugh Bancroft (who had married Barron's daughter Jane), the paper prospered. But with the Wall Street Crash in 1929 there was a huge drop in circulation.

Barron died in 1928, but his son-in-law's family the Bancrofts held 64% of the

voting stock from the 1920s to 2007. During the depression circulation fell to 28,000. Barron's daughter, Jane, instituted an employee profit sharing plan just before she died in 1949. Her daughter Jane Cook took over from her on the board. Thus, there was a continuous family ownership from the original Boston correspondent, Barron, until 2007.

By 1961 WSJ circulation rose to 800,000 and capitalization of the Dow Jones & Company rose to \$235 million. Circulation would double in another 17 years.

In the 1930s people developed a global teletype network called Telex, the precursor of today's internet. It enabled multiple people to print on-the-spot business news, stock prices, weather reports, etc., using a typewriter hooked to a telegraph, telephone or dedicated wire. They called these typewriters teleprinters, teletype or TTY. You could ask certain questions like "weather report please", but it did not have search capabilities like today's internet.





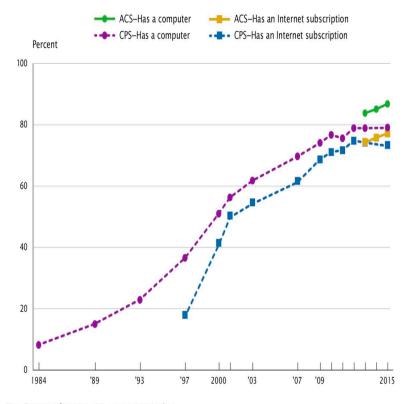


**Clarence Barron** 

Business computing with IBM started before home computers, but only with local networks. Home computers and the internet started in the 1980s (see the graph on the next page). In 1990 Sir Tim Berners-Lee invented the World Wide Web. Home computers took off. Against this backdrop the Dow Jones News/Retrieval became the preferred electronic database in 1989. Further electronic data delivery followed like the DJ Newswires in 1996. The DJ Markets division on line did very poorly and they sold it at a \$922 million loss in 1998.

Dow Jones & Co had earlier invested in Asian and European business TV networks and in 1998 partnered with NBC and CNBC in the US. In 2007 Rupert Murdoch's News Corporation bought Dow Jones & Co for \$5 billion – 70% more than its market value. Murdoch also owned Fox News Network. He wisely left the content of Fox and WSJ alone. WSJ today circulates in nine languages. The top three newspapers in the US are now: USA Today with a circulation of 4.1 million, WSJ with 2.3 million, and New York Times with 2.1 million.

# Percentage of Households With Computer and Internet Use: 1984 to 2015



Note: For more information, visit <www.census.gov/acs>.

Source: U.S. Census Bureau, 1984-2015 Current Population Survey (CPS) and 2013-2015 American Community Survey (ACS) 1-Year Estimates.

# **Graph showing that American home internet adoption occurred 1990 – 2010.**

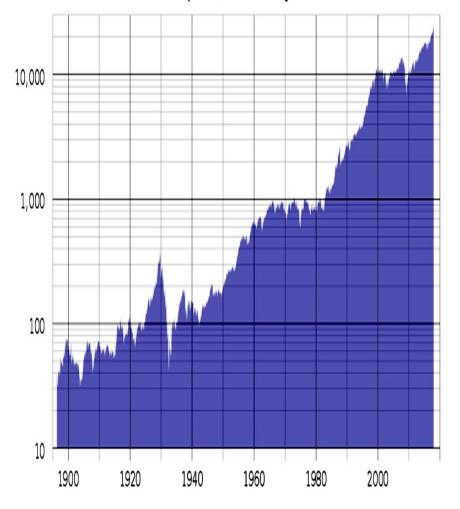
The Dow Jones Industrial Average (DJIA) remains the world's most widely quoted stock market indicator. Initially Dow simply added the stock prices of the 12 DJIA stocks and divided by 12! The math is now more complicated reflecting stock splits, but does not account for market capitalization of each stock. Most significant stocks are listed on the New York Stock Exchange, except Apple, Amazon, Cisco, Intel, Microsoft and Walgreens/Boots. They are all listed on the NASDAQ exchange.

In 2010 News Corp sold 90% of the proprietary Dow Jones indices, including DJIA, to the Chicago Mercantile Exchange for \$608 million.

The DJIA (shown graphically below) broadly shows the history of business in America:

- 1. During the panics of 1892-1923 the DJIA rose from around 40 to 90 with a lot of hiccups along the way. Today we call panics recessions.
- 2. A rise from 1923 to 1929 (the roaring twenties) from 100 to 381.
- 3. The Wall Street Crash of 1929 from its peak of 381 to its nadir of 40 in 1933, then a gradual return to its 1920 levels of 100.
- 4. Post-depression recovery from 100 to 800 from 1942 to 1963.
- 5. Stagnation from 800 to 900 1963 to 1981.
- 6. Rise again 900 to 10,000 1981 to 1999.
- 7. Stagnation again around 10,000 from 1999 to 2010.
- 8. Rise again from around 10,000 to 29,000 from 2010 to today (2020).

# Dow Jones Industrial Average



There is a tendency to read too much politics and economics behind the reasons for the Dows variations. But the market only represents confidence in the financial future. Investors can be fickle and skittish and often move like a herd.

Alexandre Dumas wrote "The Black Tulip" in 1850 describing a character during the tulipomania craze. The craze started in 1636 in Holland. People paid increasingly absurd sums for recently introduced and fashionable tulip bulb varieties. At its peak, some investors even sold their house to buy a single tulip bulb! The market bubble collapsed in 1637.

As the home computer became of age in the 1990s, venture capitalists and investment banks offered easy money for dot-coms. Many investors started using derivatives to leverage their investments. The Dot-com bubble of 1997-2001 in the US led to an unwarranted rise in stock prices.

Traditionally Price-Earnings Ratios (PER) are around 10-20, but during the dotcom run up they rose to over 100, sometimes even reaching 200! I recall friends urging me to invest, but my gut said no. I was not sufficiently sophisticated to say "a bubble is coming". I just knew it was madness. Most of the stocks were NASDAQ which fell from a peak of 5,000 in 2000 to 1,114 in 2002. Bubbles are not dead, nor will they die soon.

Amateur investors need to keep their nose to the grindstone. They also need to remember to avoid something that is too good to be true, which is another way of saying they must recognize bubbles and scams. They need to educate themselves, recognize occasional good investment opportunities, and resign themselves to the humdrum realities of long-term investments. These include diversification, buy and hold strategies, using ETF indices, re-balancing, minimizing costs, using sensible tax strategies, etc.

Many amateur investors need a good investment advisor (not themselves) specially to protect them from making bad decisions. The problem is finding one that is honest. Investors must also recognize the horizons ahead, and that the devil is always in the details. As a physician I have often seen exactly the same problem in medicine. Patients, especially academics, may have closely held and unreasonable biases, which can relegate them to a life of medical misery.

There are also themes that arise from studying the DJIA:

- 1. Initially the railroads comprised most of the market. This gradually changed to raw materials, then manufacturing, then networks, then information technology and finance. This evolution covered a period of 130 years from 1890 to the present.
- 2. Each company is like a country. They rise economically and then fall. Companies are seldom "King of the Hill" forever. The venerable GE was the only original DJIA 12 company still listed in modern times until the Walgreens Boots Alliance displaced it in June 2018.

3. There have always been cycles of growth and decline. The business cycle is the best known, but other cycles exist. Sometimes other factors intervene. An example is "Black Monday", a stock market crash with a 23% loss in a single day in 1987, possibly due to programmed trading by computers. The only day with a worse loss was December 12<sup>th</sup>, 1914. The NYSE reopened after a 15-week hiatus during the First World War. That day stocks dropped 24%.

The DJIA changed several times and I have chosen to collect the following securities:

- 1. DJTA of 11 stocks in 1884.
- DJIA of 12 stocks in 1896.
- 3. DJIA of 20 stocks in 1916.
- 4. DJIA of 30 stocks in 1928.
- 5. Longest lasting 30 stocks in the DJIA from 1896 to 2018.
- 6. Top 10 companies in 2019 (stock certificates are not available for some new companies).

#### References

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By Unknown - http://www.rugusavay.com/clarence-walker-barron-biography/, Public Domain, https://commons.wikimedia.org/w/index.php?curid=31344119

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By DJIA\_historical\_graph\_(log).svg: The original uploader was Lalala666 at English Wikipedia.derivative work: DavidRF (talk) - DJIA historical graph (log).svg, Public Domain,

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# **CHAPTER THREE**

# The 1884 Dow Jones Transport Average of 11 stocks.

#### The eleven companies of the 1884 DJTA are:

- 1. Chicago and Northwestern Railway Company
  - 2. Delaware Lackawanna and Western
  - 3. Lake Shore and Michigan Railroad
  - 4. Louisville and Nashville Railroad
    - 5. Missouri Pacific Railroad

- 6. New York Central Railroad
- 7. North Pacific Railroad
  - 8. Pacific Mail Steamship
- 9. Chicago Milwaukee and St. Paul Railroad
  - 10. Union Pacific Railroad
    - 11. Western Union



#1. Chicago and Northwestern Railway Company. 100 shares to Henry Clews and Company dated December 1935. Uncancelled. #1929



This is Wisconsin State Seal. Forward is Wisconsin motto. Sailor and miner each have horn National Union is motto. Eagle on boulder of plenty. Badger sits on shield with plow on.

Illinois State Seal. State Sovereignty supposed to be on prairie, not sea's edge.

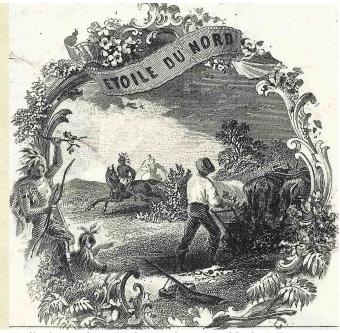
Beautiful 4-4-2 steam locomotive with cattle catcher (called pilot) The large smokestack was to prevent burning embers from wood getting to the rest of the train, passengers, or nearby woods/houses.



Michigan State Seal. Tuebor means I will defend. Si quaeris....means: If you seek a Pleasant Peninsula, look about you.



Our liberties we prize and our rights we will maintain. This is the Iowa State Motto usually on a ribbon held by an eagle, here held by a soldier.



Etoile du Nord means the North Star, and is the Minnesota State Motto. The vignette shows a white farmer plowing his field with a yoke of oxen, with Native Americans looking on.



Chicago and Northwest lines. Busiest are through states with vignettes.

It is unusual to have so many vignettes on a stock certificate. But vignettes prevented counterfeits. This certificate was worth \$10,000 at issue - a lot of money during the great depression. The American Bank Note Company of New York, who produced this certificate, likely had stock vignettes from every state. So, the directors chose the states with their railroad lines.

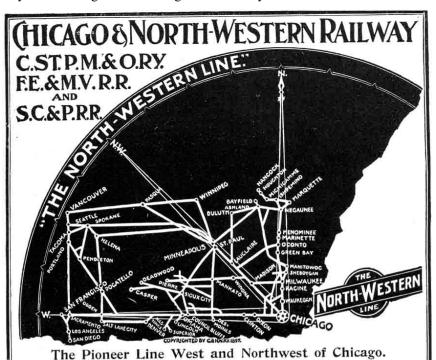
At the time they also called The Chicago and Northwestern Railway Company (CNW) the Northwestern. It had a network of 5,000 miles of lines running northwest of Chicago, growing to 12,000 miles of track by the 1970s.

Starting in 1859, it merged with the Galena and Chicago Union in 1865. By 1882 CNW owned most of the stock of the Chicago St. Paul Minneapolis and Omaha Railways. Nine years later they adopted the "Ball and bar" logo – a bar saying "North Western", with a circle behind it seen in the picture opposite.

By 1925 they were moving 10 billion freight-ton miles a year. From 1926 to 1929 they constructed the largest freight yard in the world. Located in West Chicago, it could handle 20,000 cars! The freight yard handled the transfer of mid-west crops especially potatoes, sugar beets, corn and wheat to Chicago.

The "Twin Cities 400", their renowned passenger train, started in 1935, so called because it travelled 400 miles from Chicago to Minneapolis/St. Paul in 400 minutes. That same year they went into bankruptcy but reorganized nine years later. In 1960 they bought the Minneapolis and St. Louis Railway. This was a misnomer because the train only ran to Peoria not to St. Louis! In 1968 they

bought lines to the Firestone tire plant in Des Moines, Iowa, and to the gypsum mills in Fort Dodge, Iowa. They also merged with the Chicago Great Western Railway, supplying lines from the twin cities to Omaha and Kansas City. By 1970 they were moving 20 billion freight-ton miles a year.



THE BEST OF EVERYTHING.

ELECTRIC LIGHTED THROUGHOUT

The North-Western Limited leaves Chicago daily at 6.30 p.m. for St. Paul, Minneapolis, Duluth, and the Superiors, reaching St. Paul at 7.50 and Duluth at 10.30 the next morning. This train is electric lighted throughout, including BERTH LIGHTS; has Buffet-Smoking and Library Car, Private Compartment Sleeping Car, Free Reclining

Car to the Superiors and Duluth and Dining Car Chicago to Janesville.

Other NORTH-WESTERN trains for St. Paul, Minneapolis and Duluth leave Chicago at 8.30 every morning, except Sunday, and daily

Chair Car to St. Paul and Minneapolis, Buffet-Drawing-Room Sleeping

CHICAGO AND NORTH=WESTERN RAILWAY.

PRINCIPAL ACENCIES:

NEW YORK, 461 Broadway. 287 Broadway.

at 10.15 p. m.

BOSTON, 368 Washington Street. 5 State Street. CHICAGO, 212 Clark Street. 206 Clark Street.

1898 advertisement for Chicago and Northwest Passenger services.

In 1972 CNW sold out to their employees, who sixteen years later sold it to Blackstone Capital Partners. They in turn sold it to Union Pacific in 1995. With CNW now linked with Union and South Pacific Railroad, passengers could travel on the same railroad from Chicago to San Francisco, Denver and Los Angeles.

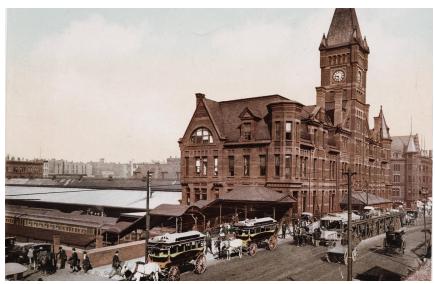
People are used to travelling long distances on the same railroad today. But in the early 1900s railroads were privately owned and you needed to change from one to the other to travel long distances.

Each year I attend the Colonial Coin Collectors Club convention in Baltimore. I can hop on an Amtrak train from New London, Connecticut, to Baltimore and sit in the restaurant car and stretch out for five or six hours. Unlike the 1800s I do not have to change trains. I could fly. But by the time I have driven to a more distant airport, arrived two hours early, stood in line to collect my luggage in Baltimore, and get a taxi into town, the travel time is five hours not six. And on the train, I get to see the countryside!

The CNW historical society has 3,000 members.



Chicago and Northwest Roundhouse 1942, where locomotives were serviced.



Chicago and Northwest Wells Street Station ca. 1900.



Old Chicago and Northwestern Terminal ca. 1912 in Chicago.

### **References:**

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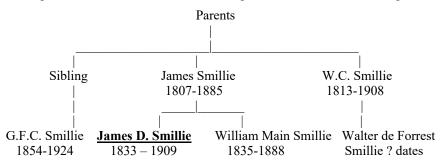
#2. Delaware, Lackawanna & Western Rail Road Company 100 shares to Hirsch & Co. February 1948. Punch and Hole cancelled.
# 1930.



Vignette of DLW showing old style locomotive, miners putting explosives in a hole, and a railway depot with elevators to load cars.

# About the vignette,

James David Smillie (1833-1909) engraved the "Coal Breaker" vignette in the center. It shows a miner who has drilled a hole in a coal seam. He is preparing to insert a charge of explosive to get out the coal without having to hack it all out with a pick axe. J. D. Smillie was from a long line of famous American engravers:



All six of these in the family above were famous professional engravers in their own rights. They all worked for major engraving companies. G.F.C. Smillie was the most prolific of all. As chief engraver at the Bureau of Engraving and Printing in 1894 he earnt \$6,000 a year, more like \$½ million a year in spending power today.

James D. Smillie, the "Coal Breaker" engraver, engraved the vignettes for the \$50, \$500, and \$5,000 large sized National Bank Notes which the US used from 1863 to 1929. He also engraved 38 vignettes for foreign bank notes, nine bond certificates and eight stock certificates during a three-year stint with the American Bank Note Company (ABNCo) 1859-1862 (aged 26-29). These incredibly skilled engravings are made by using only a graver tool to make lines on a steel plate. James then decided to be a painter. So, he travelled to Europe to paint, describing engraving as "an intolerable bore". He founded the New York Etching Club and the American Water Color Society. Though he continued to supply art work to ABNCo, he made most of his money selling watercolors. In 1877 he made \$2,526 selling watercolors, around \$250,000 in today's money. The National Academy

of Design, an honorary association of American artists, modelled on the Royal Academy in England, elected him an Academician in 1876.

Back to the Delaware, Lackawanna and Western (DLW)! Lackawanna is a small river in Northeastern Pennsylvania flowing into the Susquehanna river, which itself empties into the top of the Delaware Bay, shown on the maps below.



Above major Rivers in Northeastern US, below Lackawanna River.



The Lenape or Delaware Indians used the word Lackawanna for "stream" or "river that forks". Way at the top of the Lackawanna river it forks into the East and West Lackawanna Rivers (not shown on the map). The valley was important because of its huge anthracite coal deposits which led to the settling of Scranton, a major industrial city. The Dickson Locomotive works, a boiler manufacturer in Scranton, introduced electric lights as early as 1880. The city had the first electric streetcars in the US in 1886. This led to the city's nickname, "the electric city".

They also mined iron in Lackawanna Valley. Two brothers named Scranton established iron and steel mills in the 1840s. The Erie Railroad could not get rails from England so the Lackawanna Steel Company produced rails for the Erie Railroad. At one point in time the Lackawanna Steel Company was the largest steel plant in the US, 30 years before the Carnegie Steel Works.

In 1851 the Scranton brothers built the Lackawanna and Western Railroad to meet up with the Erie Railroad in Great Bend, PA, by the New York State border. This helped transport its rails from Scranton to New York State and the Midwest.

Many Catholics settled in Scranton which had a population of 35,000. Of these, 5,000 were coal miners. Miners included children from the age of eight, working 14 hour days in unsafe conditions. The company often paid them with company scrip which employees could redeem only at the Company store - a form of servitude - hence the song "I sold my soul to the Company store".

The Panic of 1873 was not just 1873. It was a long recession lasting from 1873 to 1879 leading to lower wages for miners, steelworkers and railroad workers and ushering in the Great Railroad Strike of 1877. It started in West Virginia when the Baltimore and Ohio Railroad cut workers' wages. The strike, before the advent of trade unions, lasted 45 days. State and federal troops put down the strike killing an estimated 100 workers.

Returning to the Lackawanna and Western Railroad, it expanded in 1853 adding lines to New Jersey, becoming the Delaware Lackawanna and Western Railroad (DLW). DLW was the biggest employer in Scranton for 100 years.

John Jay Phelps, the first DLW President, commissioned George Inness, a famous painter, to paint the Lackawanna Valley. Rather than following the Hudson River School, he painted the new Industrial Age, depicting the conflict between industrial expansion and nature's destruction.

Inness's "Lackawanna Valley" depicts a Delaware, Lackawanna and Western train heading westward from Scranton, Pennsylvania, in 1855. A roundhouse sits on the present-day site of Steamtown National Historic Site. In the background is the forge of the Lackawanna Iron and Coal Company and Lackawanna Avenue. Every month they cleaned the inside of locomotive boilers in the roundhouse, taking locomotives out of commission for a significant time.



Lackawanna Valley, by George Inness. National Gallery of Art. Washington, DC.

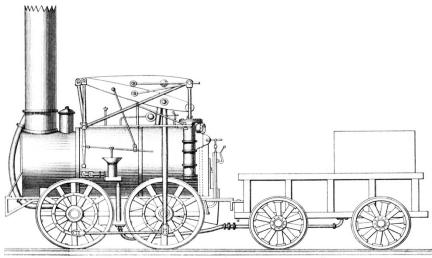
The interesting thing about DLW was that they hauled anthracite coal out of the Lackawanna valley to points north and west via the Erie Railroad at just the same time when locomotives were switching from wood to coal. First some facts about coal:

#### **Coal comes in different types:**

- 1. **Lignite**, brown coal, or hard coal, has the lowest carbon content.
- 2. **Sub-bituminous coal** is black and dull and has a higher carbon content.
- 3. **Bituminous coal** is shiny smooth but close inspection shows layers.
- 4. **Anthracite** (the highest carbon content coal) is black and shiny and lowest in volatiles. It is also called soft coal.
- 5. **Coke** this is bituminous coal that has been heated without oxygen to drive off volatiles (notably coal gas, coal tar, and water). Coke has an even higher carbon content. It is grey and porous. The Chinese knew the process of "coking" in the 300s, and the English in the 1500s. In the 1800s England used coke because of pollution problems in cities, but quietly relaxed regulations for locomotives because it cost too much. The first commercial large-scale coking operation in US was in 1885 in Walston, PA producing 22,000 tons a month.

## When did locomotives switch from wood to coal?

In England they used coal for locomotives from the very beginning of steam locomotives as they had access to coal not wood. The energy content of 2,000 lbs. of anthracite is equivalent to 5,250 lbs. of wood, so anthracite is also more efficient.



The Stourbridge Lion, first US locomotive from England in 1829.

The US imported their first locomotive from England in 1828 - the "Stourbridge Lion" designed to burn coal. But in the US in from 1820 to 1840 they only mined lignite, which was difficult to burn and was very expensive. In the 1830s it cost \$7-10 a ton though by the 1850s it was only \$3 a ton. The whole eastern seaboard was being cleared of wood for agriculture and industry so wood was plentiful and cheap. Because of this, US trains ran on wood until around 1850. The Baltimore and Ohio Railroad (B&O) used wood for their passenger trains till the mid-1850s. The East was largely deforested by 1860.

By 1859, 235 of 246 B&O locomotives had changed to coal. In the late 1850s anthracite from Pennsylvania became more plentiful. This burnt more easily than lignite. Railroads initially thought they needed to change the firebox for coal. As it turns out that was a mistake. They did not need to. Railroads experimented with different fireboxes because they did not know any better.

In New England, coal remained too expensive because they were too far from the Pennsylvania coalfields, so in New England they used wood until 1875. Chicago had access to the south Illinois coal fields, so they converted to coal sooner. However, Illinois coal was high in sulfur content making it too smelly for passenger schedules.

In summary, from 1830 to 1850 America used wood. In the 1850s they used coal in areas close to bituminous coal. Between 1860 and 1880 all major US railroads changed to coal. By 1880, 90% of US railroads used coal.

Coke was more efficient than anthracite. It also had a major advantage: It produced much less pollution. English home owners preferred coke for their fireplaces. But coke was too expensive for industry except for making steel, where it was necessary in the production process.

In the US they tried coke instead of anthracite for passenger trains but found it far too expensive. US railroads found that if they carefully fired the coal, it decreased pollution for the passengers. This involved several processes: opening all air inlets into the firebox; putting in small frequent loads of coal; distributing them well around the firebox; keeping the fire uniform; and spraying water on the coal so that coal dust did not blow off and hit the passengers. I recall travelling the Durango Silverton Narrow Gauge steam railroad, ten years ago. By the end of the journey my hair was matted, and my face was grey from coal dust!

In 1926 the Yates Oil Field in Texas produced around 2 billion barrels of oil. In the 1930s diesel engines started displacing steam engines. Diesel locomotives could run longer, and did not need to stop for water. In the very early days of steam, locomotives stopped every 7 - 10 miles for water. Later with tender cars behind them to carry water and coal they could travel 100+ miles. Diesel also required much less maintenance. Steam locomotives needed boiler clean outs every month and other expensive maintenance. Steam locomotives changed coal to energy with 5% efficiency. Diesel locomotives changed oil to energy with 25% efficiency. Diesel locomotives worked by generating electricity which then ran electric motors to drive the engines. Today gas engines are 20-35% efficient and diesel engines are 30-40% efficient in automobiles.

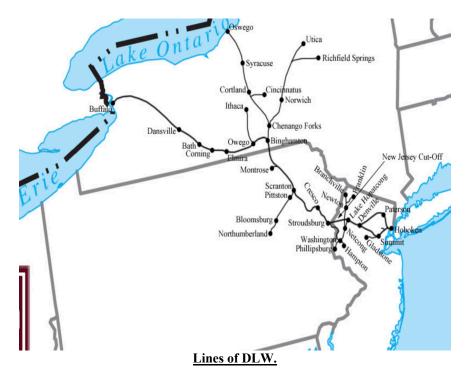
Back to DLW! All their tracks were six feet wide! Back then, they did not have standardized railroad gauges. George Stephenson (1781-1848), father of British railroads, started in 1820 using a 4' 8" gauge on the Hetton Colliery Railway. He found the wheels bound on curves, so he left the wheel width at 4'8" and increased the inside rail track to 4' 8½". This worked fine and became the international standard. DLW transferred to 4' 8½" tracks in a single day in 1876! It is said the 4'8" gauge came from Roman wheel tracks wide enough to fit a horse drawn cart.

DLW hauled huge quantities of anthracite out of the Lackawanna Valley. They got trackage rights north and west over the New York and Erie Railroad, and in 1856 expanded south to New Jersey.

In 1869 DLW bought the Binghamton and New York Railroad and leased the Oswego and Syracuse Railroad expanding to Syracuse and Oswego on Lake Ontario. By 1882 their lines ran to Buffalo on Lake Erie.

In 1907 they built a Beaux-Arts terminal in Hoboken, New Jersey, and in 1908 another in Scranton. Ferries transferred railroad cars to Manhattan. In the early 1900s DLW constructed several "cut-offs". These are not blind end tracks, but new lines built to replace deficient old lines, speeding up travel.

DLW's main profit was from transporting anthracite from the Lackawanna Valley. They also transported dairy, cattle, lumber, cement, steel, grain and passengers. The Pocono mountains in Northeast Pennsylvania became a popular tourist spot for New Yorkers to cool off in the summer's heat. In the summer DLW did a good tourist trade.



After the Second World War natural gas displaced anthracite in the Lackawanna Valley. And the new refrigeration technology displaced ice harvesting in the Pocono ponds. In 1955 DLW lost track after floods in the Poconos from Hurricane Diana, which stranded several passenger trains. DLW never recovered. After that it was all downhill. Just like other railroads after the Second World War, autos, trucks and the Interstate Highway System took over. Between 1950 to 1980 almost every US railroad would go bankrupt.

In 1960 DLW merged with its main competitor, the Erie Railroad, to form the Erie Lackawanna Railroad.

By 1976 the federal government had merged seven bankrupt railroads, including the Erie Lackawanna, to form Conrail. Three years later Conrail sold off most of the old DLW tracks to the Delaware and Hudson Railroad.

In 1991 the Canadian Pacific bought out the Delaware and Hudson, and in 2015 the Norfolk Southern bought out the Canadian Pacific.

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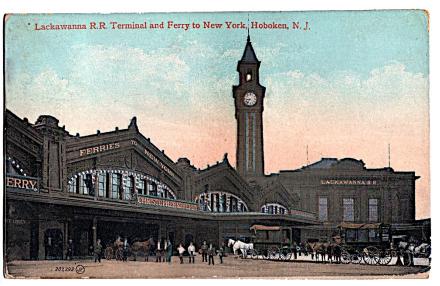
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The Lackawanna Valley - Google Art Project.jpg



Beaux-Arts Hoboken DLW Terminal built 1907, National Historic site.



DLW yards at Scranton PA, hub of Pennsylvania coal mining ca. 1895.

https://upload.wikimedia.org/wikipedia/commons/2/25/Hoboken 060606b.jpg

https://upload.wikimedia.org/wikipedia/commons/c/ce/Lackariversmap.png

https://commons.wikimedia.org/wiki/Category:Maps of rivers of the United States#/media/File: Map of Major Rivers in US.png

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By J.Brosios - Erinnerungen an die Eisenbahn der Vereinigten Staaten von Nord-Amerika von J.Brosios, Wiesbaden 1885, Public Domain,

https://commons.wikimedia.org/w/index.php?curid=8932025



#3. Lake Shore & Michigan Southern Railway Co 100 year 3½% Gold Bond \$1,000, 1897–1997. Punch cancelled 10:28:78 CLD:1PA.



Vignette showing William K. Vanderbilt, grandson of Cornelius "Commodore" Vanderbilt. Two 4-4-0 locomotives with cow catchers emerge from each side.

The vignette above shows William Kissam Vanderbilt (1849-1920). His father was William Henry Vanderbilt (1821 – 1885). William Henry's father was the famous Cornelius "The Commodore" Vanderbilt (1794-1877).

Born into poverty, "The Commodore" rose to own steamboat lines and thirteen railroads. Two of these railroads were in the DJTA eleven: The Lake Shore and Michigan Southern Railroad, and the New York Central Railroad. Could you imagine Bill Gates owning not only Microsoft but Google as well! Cornelius lived modestly. But his son, William Henry, began the family tradition of showy spending.

The Commodore left a gift to found Vanderbilt University in Tennessee. At his death he was one one of the top four wealthiest Americans in history, leaving \$100 million. The others were Rockefeller, Carnegie, and Ford.

William Henry Vanderbilt, inherited \$90 million of that. His father had carefully overseen his business training from the age of 19.

William Henry collected over 200 old master paintings and lived in a palatial Fifth Avenue mansion in New York City. Nevertheless, he worked hard. When he

died in 1885 the family's fortunes had doubled. Having fathered eight children, he left \$70 million to his oldest son Cornelius Vanderbilt II.







William Henry Vanderbilt 1821-1885



Cornelius Vanderbilt II 1843-1899 William Kissam Vanderbilt 1849-1920

It was Cornelius II (1843 – 1899) who built "The Breakers" in Newport, Rhode Island, in 1893. A great socialite, he died aged 56 from a cerebral hemorrhage. The family leadership then passed to his brother, William Kissam Vanderbilt.



The Breakers built by Cornelius Vanderbilt II 1893

William Kissam Vanderbilt (Kissam was his mother's maiden name) inherited \$55 million from his father. He took over management of the family railroad investments. But he "did his own thing". He became a leading yachtsman and bred racehorses.

After 20 years of marriage, his wife Alva divorced him for adultery in 1895. During the gilded age, the wealthy upper class tolerated adultery. They did not tolerate divorce. Indeed, they shunned divorcees. So, William moved to France where he built a chateau, started a successful horse farm, and remarried. It was his ex-wife, Alva, who coerced their daughter Consuelo to marry Charles Spencer Churchill, Duke of Marlborough. Money married royalty.

And now for the rest of the story! Lake Shore and Michigan Southern Railroad!



Genesis of Lake Shore & Michigan Southern Railroad (LS&MS).

LS&MS was so named because it followed the water level route along the south shore of Lake Erie, then ran across the southern Michigan state line to Chicago. The first railroad was the Erie and Kalamazoo Railroad in 1833, which ran from Toledo a short distance northwest. Initially horses pulled the trains, then in 1837 they got their first locomotive.

After this, many different railroads started in the area. Some did not finish, some merged, some were bought out. \*



Map showing LS&MS Railroad lines in bold.

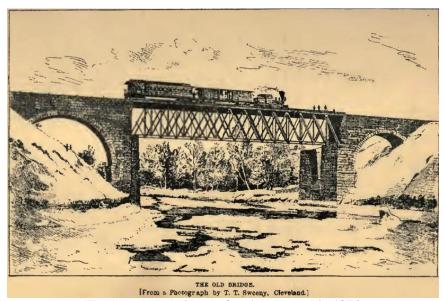
<sup>\*</sup> In 1867 the <u>Cleveland Painesville and Ashtabula Railroad</u> leased the Cleveland and Toledo Railroad (previously <u>Junction Railroad</u>). In 1868 they changed their name to the Lake Shore Railroad (see map above). In February of 1869 the Lake Shore line bought the Cleveland and Toledo, and in April the Lake Shore line merged with the <u>Michigan Southern and Northern</u> forming the LS&MS. Two months later they absorbed the <u>Buffalo and Erie</u> Railroad. This gave them a direct line from Buffalo to Chicago over 500 miles.

In 1877, the year he died, the Commodore acquired the majority of stock of LS&MS. This formed an ideal extension of the New York Central and Hudson Railroad linking New York City to Chicago about 800 miles away.

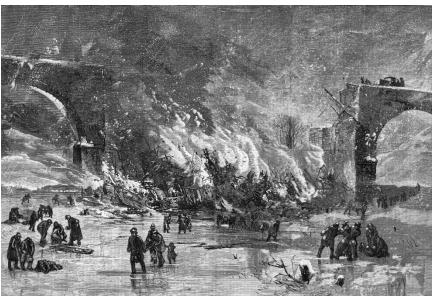
In 1914 LS&MS and the New York Central and Hudson merged to form the New York Central Railroad. In 1968 the New York Central merged with Penn Central, and in 1976 they became part of Conrail. Conrail became a for-profit freight only railroad in 1983 when they sold off passenger services to Amtrak who now run the same line from Buffalo to Chicago.

The LS&MS also had a major branch line to Brookville, in northwest Pennsylvania linking up with oil fields and refineries on the Allegheny River. There are impressive bridges and tunnels there. However, the coal traffic dried up in the 1990s and they cut the line back.

The worst disaster in US railroad history, called the Ashtabula disaster (pronounced Ashta<u>bu</u>la), occurred on the LS&MS Railroad. In December,1876 a wrought iron truss bridge fractured, plunging a passenger train 70 feet onto the icy creek below. Cars smashed onto the ice. Fires started from the kerosene heating stoves and lamps. The fires then melted the ice killing 92 of 159 passengers and injuring most of the rest.



The Ashtabula bridge before it collapsed in 1876.



The Ashtabula disaster 1876 showing train in flames melting the ice.

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https://en.wikipedia.org/wiki/William Kissam Vanderbilt#/media/File:W.K. Vanderbilt LCCN201 4685935 (2) (cropped).jpg

https://en.wikipedia.org/wiki/Cornelius Vanderbilt II#/media/File:GENERAL VIEW FROM TH E SOUTH - The Breakers, Ochre Point Avenue, Newport, Newport County, RI HABS RI,3-NEWP,67-6.tif

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https://en.wikipedia.org/wiki/Ashtabula River railroad disaster#/media/File:Ashtabula bridge.jpg https://en.wikipedia.org/wiki/Ashtabula River railroad disaster#/media/File:Ashtabula Bridge Disaster postcard.jpg

https://en.wikipedia.org/wiki/Ashtabula River railroad disaster#/media/File:Ashtabula Bridge disaster.jpg



#4. Louisville and Nashville Railroad Equipment Trust. \$1,000 Specimen Bond at 4½% 1960-1975.

It shows 30 attached coupons for \$22.50 each. The bond was backed by equipment put into a trust managed by a bank.

Unlike most specimen certificates this one is signed. Hole cancelled and stamped SPECIMEN. #1966.



Vignette on Louisville & Nashville Railroad Bond showing diesel locomotive with L & N markings. This is a halftone printing not intaglio like the borders are.

The Commonwealth of Kentucky started the Louisville and Nashville Railroad (L&N) in 1850. They wanted a track built from Louisville, Kentucky, to Nashville, Tennessee to prevent competition from Cincinnati, Atlanta and New Orleans. The next year Tennessee allowed L&N to extend their track to Nashville. It cost Kentucky \$7 million to build the five-foot gauge track, a lot of money back then. The first locomotive completed the 180-mile journey from Louisville to Nashville in 1859.

The railroad was based in Kentucky - a Union state during the Civil War (1861-1865). Luckily for them, people paid them with Union currency. By 1865 a dollar of Union paper currency bought 66 cents of gold. By contrast in April 1865, a month after Lee's surrender at Appomattox, a confederate paper dollar bought

only 1.6 cents of gold! Other Southern railroads that were paid in depreciated Confederate currency often went bankrupt.

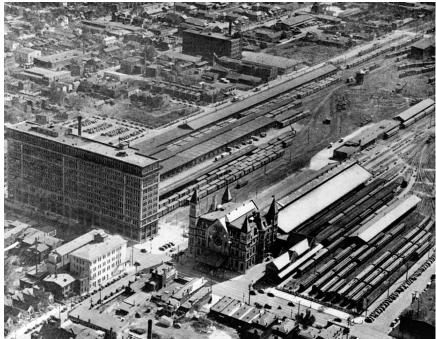
At the onset of the Civil War L&N had 261 miles of track. At the end of the Civil War, they took over many other bankrupt Southern railroads. In 1870 they decided to convert to the more standard 4' 8½" gauge. Two years later L&N took over the debts of the Memphis, Ohio and Clarksville Railroad in exchange for management control, bringing them up to 921 miles of track.

By 1880 L&N had lines from Ohio to Florida, and took control of the Nashville Chattanooga and St. Louis Railroad, increasing their track to 1,840 miles. In 1889 they had 436 locomotives, 339 passenger cars and 12,534 freight cars, suggesting that freight was their largest business.

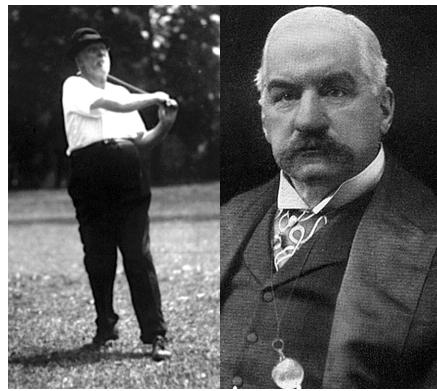
Early on L&N realized the importance of coal supply. So, they purposely expanded into two coal-rich areas, Eastern Kentucky and Birmingham, Alabama, despite the expense of building hilly lines. Aggressive as always, the L&N bought controlling interests in smaller competing railroads. In 1884 Milton Smith became President of L&N. He held the reigns until 1921 when he retired. By then L&N owned over 6,000 miles of track! Although clever, Smith was not a people person – more about that later.

J.P. Morgan had been quietly buying up stock in L&N, and had a controlling interest. Wisely, he did not change management in the company. Morgan ended up selling those interests to the Atlantic Coast Line in 1902 because of other financial speculations he made. Likewise, the Atlantic Coast Line did not make management decisions either. Both they and Morgan must have felt L&N was well run and would be better left alone.

In 1907 L&N built their headquarters in Nashville. It was a huge, Beaux-Arts style stone building pictured below, now on the US Historical Register. In 1970s they still had 2,000 employees working there. When CSX (Chessie Seaboard X) took over in 1980 they abandoned the building. It is now used for state offices.



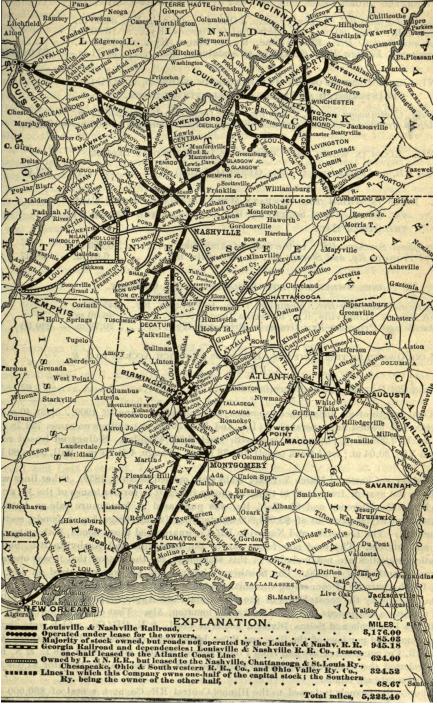
1901 Aerial view of Louisville terminal with headquarters building on left.



Milton Hannibal Smith in 1907. John Pierpont Morgan? around 1900

L&N helped to develop the southeastern US, by supplying a successful transportation network. It had a monthly employee magazine from 1925 to 1974 which created great publicity for the railroad. The magazine contained sections on human interest stories of employees; sections for women and children; sections on news of retirements, births, deaths and weddings; and sections on stories about L&N and the cities and towns where their tracks stopped.

L&N paid African Americans lower wages then whites. During the Second World War, women and minorities replaced white labor (who left as soldiers). Although many whites left, white men retained most of the skilled jobs. In 1946 an African American employee named Steele, won a US Supreme Court case against L&N. The case claimed a union could not contract with a company that discriminated against non-member minority workers.



L&N controlled track ca. 1901 from Ohio to Louisiana, and Florida

The First and Second World Wars increased demands for manufacturing and transport. This benefitted L&N enormously. Between 1945 and 1950 L&N switched to diesel locomotives. In 1971 the Seaboard Coast Line Railroad bought L&N freight, and the government-run Amtrak took over L&N passenger trains. Eleven years later the Seaboard Coast Line absorbed L&N (which by then owned 10,396 miles of track) to form SCL/L&N.



Original L & N logo

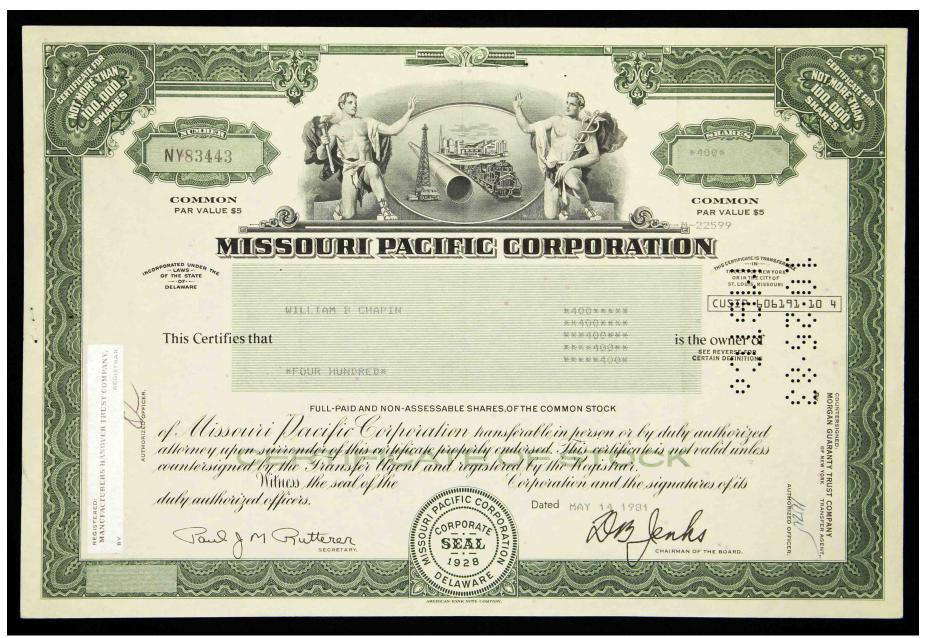
In 1986 SCL merged with "Chessie" to become CSX. When the lawyers negotiated for the merger of Chessie and Seaboard they wanted a three-letter acronym. They thought of CSM, but the acronym was already in use, so they decided instead on CSX (Chessie, Seaboard and the X stood for nothing). A nice trick when someone catches you out with a three-letter acronym is to ask them what TLA stands for - the answer: Three-Letter Acronym!

The L&N Historical Society publishes a magazine four times a year. They have a yearly convention and keep the history and ties of L&N going. The Tennessee Central Railway Museum also has an extensive display of L&N memorabilia.

#### Reference

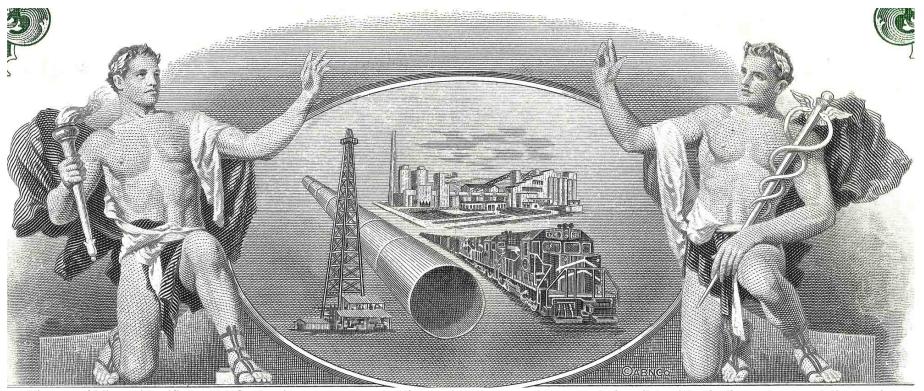
https://en.wikipedia.org/wiki/Louisville and Nashville Railroad#/media/File:L%26N logo.png https://en.wikipedia.org/wiki/Louisville and Nashville Railroad#/media/File:1901 Poor%27s Louisville and Nashville Railroad.jpg

https://upload.wikimedia.org/wikipedia/commons/9/90/Louisville\_aerial.jpg https://en.wikipedia.org/wiki/J. P. Morgan#/media/File:JohnPierpontMorgan.png https://www.loc.gov/item/2004678718/



#5. Missouri Pacific Stock Certificate to William Chapman for 400 shares in May 1981. Signed by famous President Downing Jenks, who pioneered computer guided rail technology. Seal shows they incorporated in Delaware in 1928. Punch cancelled 10·25·83

MSTCo. A year later Union Pacific bought Missouri Pacific, to satisfy bondholders. They only finalized it in 1997. #1932.



Vignette of Missouri Pacific by ABNCo showing two men, one holding torch and other caduceus, enclosing oil derrick, pipeline, granary and diesel train.

In the vignette the torch symbolizes hope. The caduceus is the attribute of the travelling messenger god Hermes in Greece (Mercury in Rome). I could not locate the artist. The vignette carries only the signature of ABNCo.

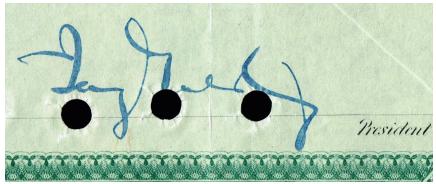
The Missouri Pacific Railway (MP), nicknamed "The MoP" or "MoPac", was the first railroad west of the Mississippi River. In 1851 St. Louis started the <u>Pacific Railroad</u> to build west of the Mississippi River. The Civil War (1861 – 1865) interrupted their building. In 1872 the railroad reorganized as the MP.

Jay Gould (1836-1892), was a rapacious financier and one of the unscrupulous "robber barons" of 19<sup>th</sup> century US capitalism (an era Mark Twain called "the gilded age"). From 1879 until he died in 1892, he controlled MP. He recognized early that MP was expanding westwards and that this threatened to compete with the Union Pacific, which he also owned. The robber barons' standard way to thwart competition was to buy a controlling interest in it.

This was in the days when monopolies were legal. In 1887 Congress instituted the Interstate Commerce Commission. This made it illegal for companies that did business in more than one state to be a monopoly. The Sherman Anti-Trust Act of 1890 further strengthened this legislation.

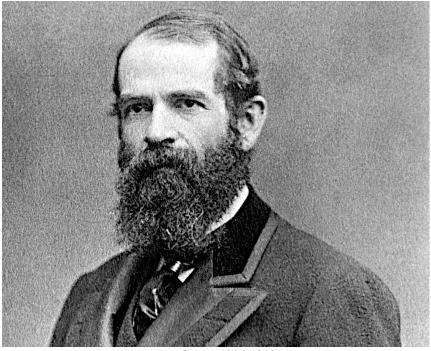


Missouri, Kansas & Texas Railroad Stock Cert. 1880 signed by Jay Gould.#2431



Signature of Jay Gould on Missouri, Kansas & Texas RR 1880 Stock Cert.

As a young lad Gould told his father he did not want to continue the family tradition of farming. So, his father simply left him at a nearby school under the care of the school principal. But Gould was self-motivated. He studied surveying and math. Aged 20 he published *History of Delaware County, and Border Wars of New York*. Shortly after, he partnered with a certain Mr. Zadock Pratt in a tanning business. Gould bought him out, then partnered with a Charles Leupp, a leather merchant, until the Panic of 1857. Gould bought him out too. Panics or recessions in those days enabled people with money to buy things up at rock bottom prices.



Jay Gould 1836-1892.

At the age of 21, Gould met Daniel Miller, who introduced him to the railroad industry and stocks. Two years later Gould bought controlling stock of the Rutland and Washington Railroad. He continued to speculate in stocks. Three years later he married Miller's daughter, Helen. That same year the Rensselaer and Saratoga Railroad appointed him manager.

Ever the consummate stock manipulator, he began buying up gold in 1869 trying to corner the market. Why? Gould had approached Abel Corbin, a small-time speculator, who had married President Grant's sister. Gould thought he could get inside information from Corbin about gold prices. He planted the idea that government gold sales might hurt western farmers, and bought up gold at low prices, hoping to corner the market. President Grant realized his trickery and flooded the market with gold to lower prices further on Black Friday, September 24<sup>th</sup>, 1869. Gould got out only just in time. Favored by New York Senator Tweed, the "Boss" of Tammany Hall (the Democratic Party-political machine), Gould narrowly escaped prosecution, but lost a fortune in subsequent lawsuits on the matter.

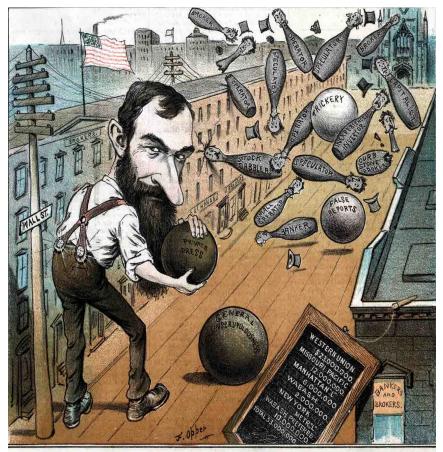
In 1868 Jay Gould, James Fisk and others manipulated stock in the Erie Railroad. As a consequence, Gould became Erie President. This was called the "Erie War". In 1873 Gould tried to take control of the Erie Railroad. He bribed Lord Gordon-Gordon of Scotland (whom he believed was wealthy) with \$1 million of stock. But Lord Gordon-Gordon turned out to be an impostor and cashed in the stock immediately! Gould sued him. So, Gordon-Gordon fled to Canada. Gould then tried unsuccessfully to force Canada to give him up. Then Gould tried to have Gordon-Gordon kidnapped! That also failed! The newspapers had a heyday publicizing the debacle! Gould lost any chance of taking over the Erie Railroad.

Having been ejected from the Erie Railroad, he bought controlling stock in the Union Pacific (UP) during the Panic of 1873 (read recession of 1873-1879). He managed UP expertly. He had an encyclopedic knowledge of its workings. Railroads could be very profitable back then. Although Gould made money playing the stock market, he also made money from railroads.

In 1879 Gould also bought controlling stock in the Missouri Pacific. In 1883 he left Union Pacific management with a huge cash profit. He still controlled the railroad. He also bought controlling stock in Western Union. Western Union, Missouri Pacific and Union Pacific were all in the 1884 DJTA. Today this would be like Bill Gates controlling three companies - Microsoft, Alphabet and Apple!

In 1889 Gould organized the Terminal Railroad Association of St. Louis. This was pure nastiness. He knew he could create a bottleneck for East-West traffic which he controlled. Three years later he died from tuberculosis. He had amassed a fortune of \$72 million.

Jay Gould had eight children. His son George took over Missouri Pacific. But within a year it declared bankruptcy during the Panic of 1893 (recession).



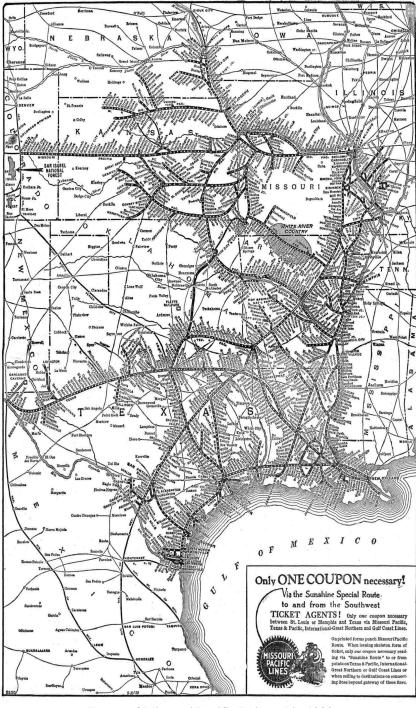
JAY GOULD'S PRIVATE BOWLING ALLEY.

# Media's view of Gould using the stock market as his private amusement arcade.

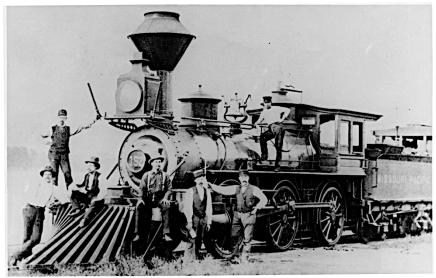
Continuing with the story of MP: After the 1893 bankruptcy under Jay Gould's son George, MP reorganized. It declared bankruptcy again in 1915. Then in 1919 it merged with SLIMS (St. Louis, Iron Mountain & Southern Railroad) as the Missouri Pacific Railroad, rather than the Missouri Pacific Railway.

In 1933 MP again went bankrupt as did many railroads during the great depression. But in 1956 MP again reorganized. Good Lord! How many times can a company go bankrupt!!! In 1961 MP President, Downing Jenks (who signed the certificate on page 36), pioneered computer guided rail technology. In 1970 MP carried 27 billion freight ton-miles. By 1980 MP owned 11,469 miles of track and 1,500 locomotives.

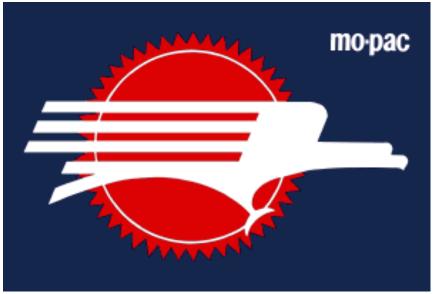
In 1982 Union Pacific, though smaller than MP, bought MP. The merger only became official fifteen years later after they had satisfied all bondholders. Union Pacific also bought the Western Pacific Railroad. Today MP, UP and Western Pacific are under a holding company, the Union Pacific Corporation Holding Company.



Extent of Missouri Pacific Railroad in 1930.

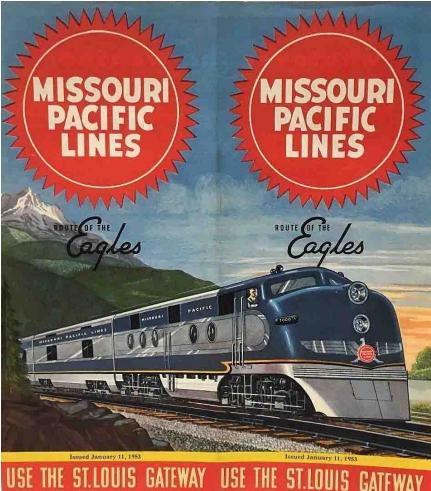


 $\frac{\text{0-6-0 wood locomotive with cow catcher (pilot) note Missouri Pacific on}}{\text{tender.}}$ 



Missouri Pacific Screaming Eagle Herald logo used 1969-1984.

The MP Historical Society started in 1980 in Missouri. It has an annual convention and a quarterly magazine called the Eagle. From 1939 to 1961 MP painted locomotives "cerulean blue, abilene grey, and icterine yellow", the colors of an eagle, hence the name of their magazine. Jenk, who became MP President in 1961, decreed locomotives be painted just blue ("Jenk's blue").



Missouri Pacific Magazine from 1953 showing color scheme of locomotive.

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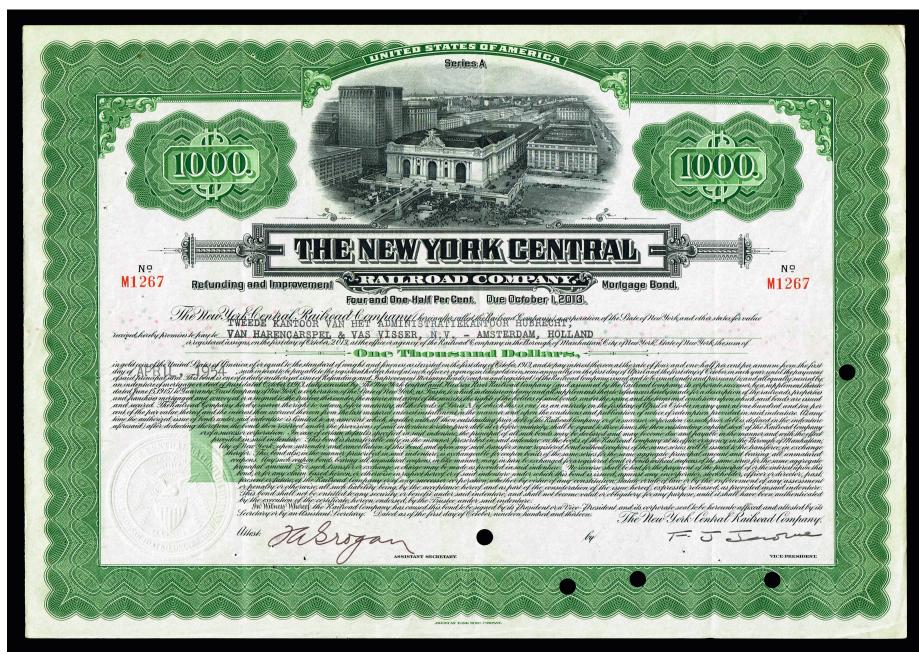
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By Missouri Pacific Railroad - Transferred from en.wikipedia to Commons by SchuminWeb using CommonsHelper., Public Domain, <a href="https://commons.wikimedia.org/w/index.php?curid=17068394">https://commons.wikimedia.org/w/index.php?curid=17068394</a>

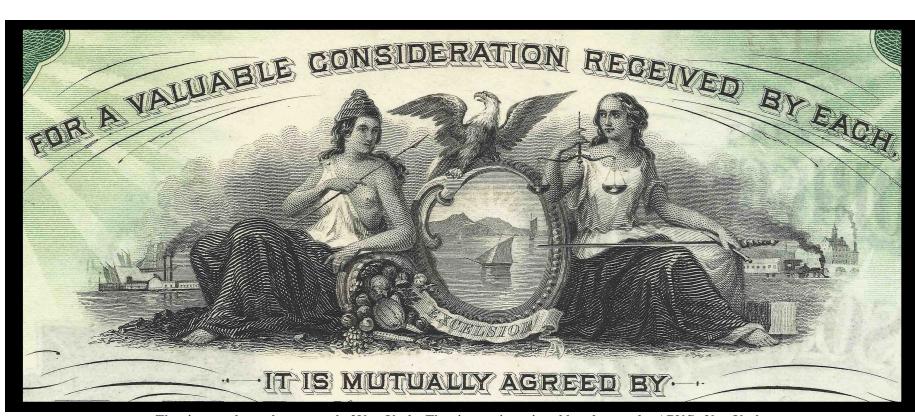


#6. New York Central Railroad Company with Grand Central Station vignette. 1913, 100 Year 4 ½ % \$1,000 bond issued to a Dutch administrator, dated April 1954. Hole cancelled. #1918.



In 1869 "Commodore" Vanderbilt merged his New York Central with his Hudson River Railroads to form the New York Central and Hudson River Railroad. \$1,000 4% gold bearer bond dated 1892, maturing 1905. Hole cancelled, and stamp cancelled on back.

After numerous acquisitions this became the New York Central Railroad again in 1914. #1888.



The vignette shows the state seal of New York. The vignette is unsigned but done under ABNCo New York.

The vignette is the New York State Seal (center). It shows a shield with a ship and sloop on the Hudson River (symbols of inland and foreign commerce), with a mountain range in the background and the sun's ray rising behind. Liberty, wearing a Phrygian cap, supports the shield on the left. But incorrectly she holds a spear rather than a pole for the cap. On the right is Justice, holding scales (usually held in the left hand), sword, and in this case no blindfold (the blindfold attribute started in 15th century, and is not always present). The word Excelsior means higher, though is commonly translated as "Ever Upward". An eagle is perched on a globe atop the shield. On the left side is maritime scene with sidewheel steamer, and a two-masted sailing ship. On the right side is a land scene with an industrial building and an early locomotive.

The New York Central (NYC) operated in New England and the Great Lakes. It merged railroads running from Albany to Buffalo in New York State. Established in 1853, it included the Mohawk and Hudson Railroad. The Mohawk was chartered in 1826, and was one of the oldest railroads in the US. Usually when one looks up the history of railroads, authorities give a tedious detailed listing of which railroad merged with which, who bought out who or became bankrupt, etc. The resulting depiction is total confusion! Many of the original NYC lines ran at water level by the Great Lakes or close to the Erie Canal, so there were few hills.



New York Central in 1918 with trackage rights in purple.

The Wikipedia entry for the NYC lists at least 22 different railroads that merged before the NYC even started in 1853! As a child, I once asked a man how long he had been doing something. He replied, "long before you were even thought of"! Many railroads would form NYC, long before NYC was even thought of!

All the previous 20+ railroads had reduced to ten after various mergers and take overs. People like Vanderbilt and Gould probably knew the track mileage, lines, railroad stops, freight and passenger figures of every railroad they owned or aspired to own, as well as numerous other details. In 1853 an Albany industrialist Erastus Corning united all these local railroads into a single one. It is amazing that so many different railroads' stockholders and executives could agree! Incidentally, merging required approval by the New York State Legislature.

Naturally, after formation, NYC brought other railroads into the fold. By fair means or foul, they brought in another five railroads from 1853 to 1867.

The Hudson River Railroad started in 1846. It ran on the eastern side of the Hudson River reaching New York City in 1851. Cornelius "Commodore" Vanderbilt bought controlling shares of the Hudson River Railroad in 1864. Three years later he bought the New York Central. Two years later he merged the New York Central and the Hudson River Railroads to form the New York Central and Hudson River Railroad (NYC&HR). Check out the bond two pages ago.

The Commodore operated the New York and Harlem, Lake Shore and Michigan Southern, Canada Southern, and Michigan Central as part of NYC&HR. By 1873 he offered a direct run from New York city to Chicago. He also built the Grand Central Depot (predecessor to Grand Central Terminal) in 1871.



Grand Central Station 2015 empty during a blizzard.



Vibrant activity inside the Grand Hall of Grand Central Station.



Ceiling of Grand Central showing astrological signs, note Pisces left.

It is truly the most amazing railway station I have ever been in. Splendid, capacious and ritzy.



Vignette of Grand Central Station New York City by ABNCo showing lower and upper levels, taken from stock certificate at beginning of this section.

As previously mentioned, when the Commodore died in 1877 he left \$100 million, almost all to his sons and grandsons. He left a pittance to his wife and daughters. In 1885 NYC&HR took over the New York West Shore and Buffalo Railroad. Two years later it took over the Pittsburgh and Lake Erie Railroad. By 1914 eleven subsidiaries had merged with NYC&HR reforming the New York Central Railroad (NYC), including New York and Harlem Railroad.

Most of NYC had flat grades following rivers. They built their locomotives for speed, not for slow mountain climbing. Enthusiasts loved these locomotives. The most famous was the "Twentieth Century" which ran from Grand Central to Chicago with first class service from 1902 to 1967. One hundred years ago, it did the 960-mile trip in 16 hours, an average speed of 60 mph!

But like other railroads their days were numbered. The reasons were many:

• Interstate Commerce Commission regulation

- Unions
- Automobiles and trucks competing with the railroads
- The Interstate Highway Act of 1956
- Airlines competing with the railroads
- In 1959 the St. Lawrence Seaway opened, which allowed container ships to move from the Atlantic inland to the Great Lakes.
- All states taxed railroads. But the federal government maintained the interstate highways and did not tax them
- The federal government imposed a 15% tax on passenger fares during the Second World War which they did not lift until 1962.

In 1925 New York Central (NYC) freight traffic was 36 billion ton-miles. In 1960 it fell to 32 billion. In 1925 NYC passenger traffic was 4 billion passenger miles. In 1960 it fell to 2 billion. Robert Young, a railroad visionary, took over the NYC from 1954 to 1958. When he failed he committed suicide. Alfred Perlman took

over from 1958 to 1968, developing centralized traffic control, and cutting costs. The inexorable downhill course of the railroad business continued. NYC's biggest rivals were the Pennsylvania Railroad, B&O railroad, and Delaware Lackawanna and Western Railroad.



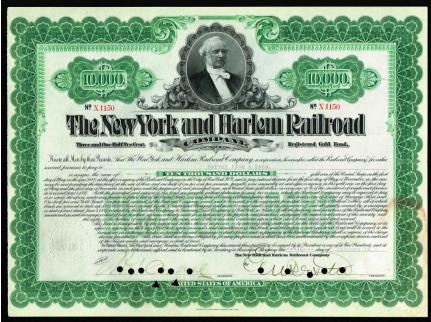
Façade of Grand Central Station New York City (compare with vignette).



Twentieth Century Limited train 1938, Grand Central to Chicago in 16 hours!

NYC first discussed merging with the Pennsylvania Railroad in 1955, but it took over a decade of talks before they merged in 1968. The merger was a nice try. But it failed because of competing cultures and interference from the ICC and unions. Two years after they merged, Penn Central and NYC declared bankruptcy - the largest bankruptcy at the time in the US.

During the bankruptcy, lawyers froze what Penn Central owed other railroads. But what other railroads owed to Penn Central had to be paid. This just made many other railroads bankrupt! In 1970 the Rail Passenger Service Act shaped Amtrak, a government owned and subsidized intercity passenger railroad. Conrail was the equivalent government salvage operation for freight railroads which started in 1976.



New York & Harlem \$10,000 3½% gold bond dated 1906 maturing 2000.

One of first railroads in US (1832) and possibly the first street railway.

Note vignette of Commodore Vanderbilt at top.

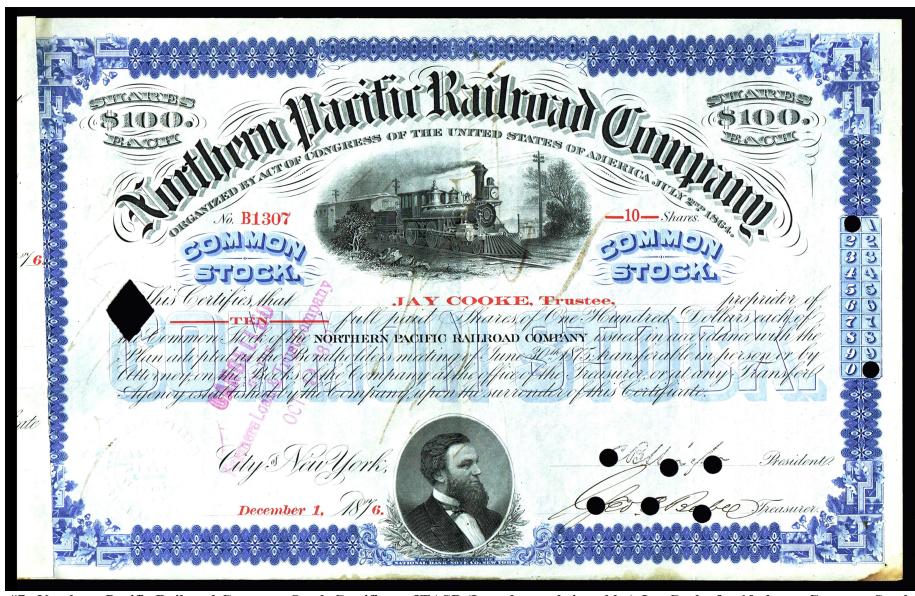
NY & Harlem became part of NY Central.

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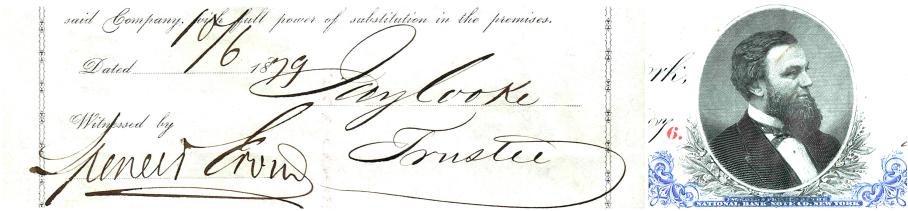
Empty Grand Central Terminal (16377099101).jpg

https://en.wikipedia.org/wiki/New\_York\_Central\_Railroad https://www.american-rails.com/new-york-central.html



#7. Northern Pacific Railroad Company Stock Certificate ITASB (Issued to and signed by) Jay Cooke for 10 shares Common Stock

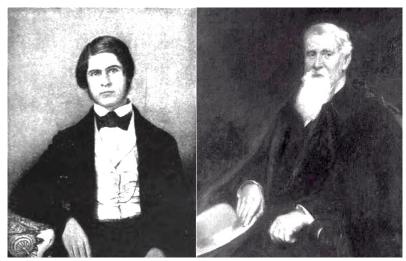
December 1876. Stamp, hole, and cut out cancelled October 1879. Stock Certificate is pasted to stub. #2303.



Flowery signature of Jay Cooke on back of above stock certificate. Vignette is of Frederick Billings. Artist possibly James Smillie (1807-85). Printed by ABNCo

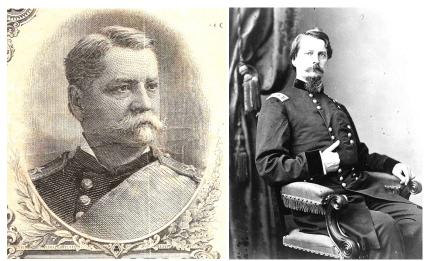
The North Pacific Railroad (NP) operated from Minneapolis to the Pacific Northwest. Abraham Lincoln signed an Act in 1864 giving 62,000 square miles to the railroad to open land in the northwest. Much of the route followed Lewis and Clark's route from the Missouri River west. NP used the land as collateral to raise money in Europe.

Construction started at both ends in 1870. NP brought in Jay Cooke the financier who brought money to the table. Jay Cooke (1821-1905) was famous for his expertise as a financier, particularly in selling Union bonds. His father, a lawyer and Whig Member of Congress, failed in business and Jay had to go to work young. Aged 17 he joined the banking house E.W. Clark & Co. as a clerk. Four years later he became a partner. He retired from there in 1858 but abhorred idleness so opened his own banking house, Jay Cooke & Co. in 1861, which also employed his sons.



Jay Cooke as a young and as an old man

Cooke helped Salmon Chase get his job as Secretary of the Treasury during the Civil War. Chase hired him to sell \$500 million worth of Union bonds to help the war effort. The Treasury could not sell enough bonds themselves. Cooke hired 2,500 sub-agents and financed a national sales campaign. He bought newspaper ads and worked with editors on articles about bonds to get newspapers to support him. He sold another \$830 million for the Union in 1865. From the \$2 billion of bonds he sold he made a 0.375% commission, netting him \$7.5 million before expenses.

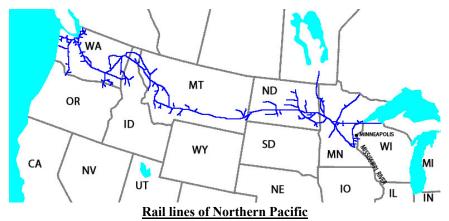


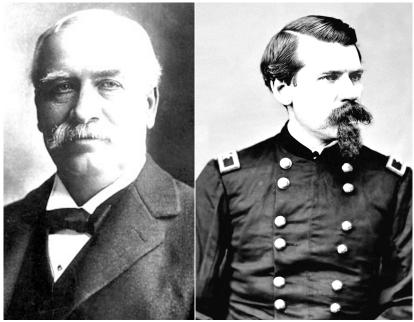
Vignette of Gen Hancock from \$2 Silver Certificate, photo right.

Cooke wanted to develop the northwest. He had a "thing" about Duluth, Minnesota and wanted it to make it into another Chicago. NP brought in Cooke to finance the railroad. Cooke obligingly invested \$100 million of his own money in NP.

Cooke found it difficult to sell bonds in Europe and overextended his financial house. Indians constantly attacked surveyors and construction teams. The US government had to send 600 soldiers under General Winfield Hancock (see previous page) to protect them.

Construction proceeded well from 1870 to 1873. But there was a worldwide recession from 1873 to 1879 (the Panic of 1873). NP had underestimated the cost of construction, and with the Panic, Cooke went bankrupt. George Stephen and Donald Smith, Canadian financiers who built the Canadian Pacific Railway, then bought out Cooke's shares for pennies on the dollar. By 1880 Cook had repaid his debts and again became wealthy, living in Pennsylvania until he died.





Henry Villard.

Gen. Horace Porter

After the 1873 bankruptcy Fred Billings, a Vermont lawyer, developed a reorganization plan. NP later made him President. His portrait is on the bottom of the NP stock certificate on the preceding page. Billings in Montana was named after him. NP continued sporadic construction till 1877 with a line to coalfields around Wilkeson, WA, and built a large shop complex in Edison, Washington, (now part of Tacoma).

A German entrepreneur and journalist, Henry Villard, raised European capital for western railroads. He started a holding company, the Oregon and Transcontinental Co., and bought up railroads. His lines competed with the NP.



This stock certificate for the Oregon and Transcontinental Co. of Villard shows how they used to handle many old canceled certificates. Rather than cancelling it and putting it in a pile, they glued it back into the stub book.

Dealers then bought old stub books. They tore out each stub with glued certificate for sale. Issued in 1881 for 100 shares to Horace Porter. The certificate is stamp cancelled and cut-out cancelled.



This certificate was issued to and signed (on the back) by Horace Porter, something the scripophily fraternity calls "ITASB". It was quite a while before I could figure that one out! Horace Porter had a distinguished career. During the Civil War he reached Brigadier General. He became Personal Secretary to President Grant and to General Sherman. He also became Vice President of the Pullman Palace Car Company and US Ambassador to France. During the Black Friday Gold scandal in 1869, Horace Porter refused a \$500,000 bribe from the scam artist, Jay Gould, and told Grant about it. Grant flooded the market with gold and Gould narrowly escaped bankruptcy.



Classic Vignette from the above certificate of two Indians looking at the new civilization: the clash between the noble savage with their unspoiled land, and industrialization.

So, what do you think Villard did to monopolize northwestern railroads? Yes! Buy everyone else out! He made himself President of NP from 1881 to 1884. He raised \$8 million and bought out NP. A single bridge across the Missouri River in 1883 cost \$1 million. (Before the bridge people crossed by ferry. In the winter they simply laid tracks on the ice!)

Villard chartered trains to Gold Creek, in western Montana. He invited Billings, President US Grant and other dignitaries to travel with him to publicize the new northern east-west link. President Grant drove in the final gold spike when the east and west railroads linked up in the northwest in 1883.

But business was insufficient. Villard had a nervous breakdown. (Later he recovered enough to return to the board from 1887 to 1893). NP solved the problem in a novel way. In 1886 they opened emigration offices in Germany and Scandinavia for farmers to settle along the fertile Red River valley (between Minnesota and North Dakota). They sold the land cheaply. And the farmers were used to sub-zero winters. NP used land grants as security for loans. They had to pay taxes on the land so sold as much as possible to farmers. The scheme was a spectacular success.

The famous radio show "A Prairie Home Companion" with Garrison Keillor talked incessantly about Lutheran Scandinavians in Northern Minnesota. This is where they all came from!

Most have heard of "King Cotton" in the antebellum South. But from 1850 to 1900 was a period of "King Wheat" in Minnesota. The largest industry in early Minnesota was lumber. Production rose from 12 million board feet in 1856 to a billion board feet in 1900. But wheat flour eclipsed wood as the most valuable product in the 1860s. Production rose from 30,000 barrels a year in 1860 to 250,000 barrels a year in 1870. The Red River Valley did well later with sugar beets.

Another railroad, the Great Northern Railroad opened in 1893. This duplicated NP's route from Minneapolis to Puget Sound. Both NP and the Great Northern did not build a connection to Chicago – a serious problem. Not surprisingly NP declared bankruptcy a year after the Great Northern opened. Enter J.P. Morgan! He bought controlling stock interests in both railroads, brought in new management styles, and finance-based decision-making. He had deep pockets!

Business was complex. Multiple railroads competed with different stock prices, routes, business plans and unions. Add to that the new the Interstate Commerce Commission and the Sherman anti-Trust Acts. Both had labyrinthine rules and regulations. But J.P. Morgan's captains sailed those seas well.

After a link to Chicago in 1900, business improved. The North Coast Limited was the premier passenger train from Chicago to Seattle, which ran from 1900 to 1971. Yakima Valley farmers grew giant potatoes weighing one to two pounds each! But they could not sell them. So, in 1908 NP bought them up and promoted them using Hollywood stars. All NP's dining cars served the famous potatoes!

NP owned coal mines in Rosebud, Montana. They produced semi-bituminous coal that had two-thirds of the energy capacity of anthracite. So, they needed longer locomotives with larger fireboxes. The American Locomotive Company (ALCO), a later DJIA company, built 5,000 locomotives for NP. Another locomotive works, the Baldwin Locomotive Works, would follow them into the DJIA in the 1930s.

Morgan shared control of NP with competitor James Hill, who owned the Great Northern Railroad. Hill wanted to combine the Great Northern, the NP, and the Chicago, Burlington and Quincy Railroad Companies. The Supreme Court nixed this in 1904 as violating the Sherman Antitrust Act.

The three finally merged in 1970 forming the Burlington Northern. Twenty-five years later the Burlington Northern merged with the Atchison, Topeka and Santa Fe Railroad, to become the Burlington Northern and Santa Fe line.

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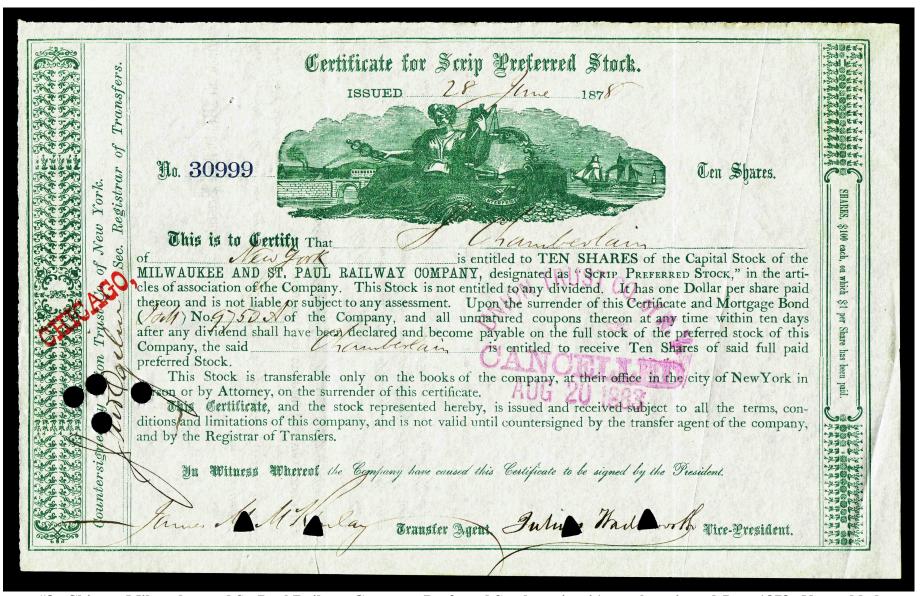
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https://upload.wikimedia.org/wikipedia/commons/1/19/JayCooke-BW.JPG

https://en.wikipedia.org/wiki/Jay Cooke#/media/File:Jay Cooke engraving 1839-1840.png



#8. Chicago Milwaukee and St. Paul Railway Company Preferred Stock paying \$1 per share issued June 1878. Note added CHICAGO stamp. Not liable for assessment i.e. company cannot come after shareholder to pay more. Can be exchanged for 10 shares of regular stock. Hole and stamp cancelled August 1883. #2060

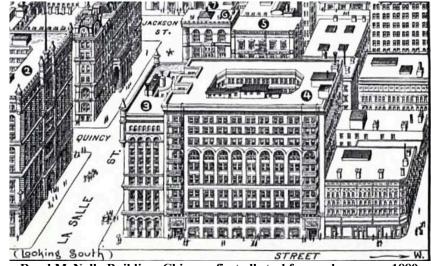


Vignette of Milwaukee & St. Paul Railroad, lithograph rather than intaglio. Lady holding caduceus and scales with New York like shield, labeled enterprise.

The original DJTA eleven in 1884 included the Chicago, Milwaukee and St. Paul Railway. The railroad operated in the Midwest and Northwest US from 1847 to 1980. People later called it the Chicago, Milwaukee, St. Paul and Pacific Railroad, or more commonly the "Milwaukee Road". Railroads constantly changed their names because of new acquisitions, mergers, bankruptcies, etc.

In 1847 the Milwaukee and Waukesha Railroad wanted to link Milwaukee to the Mississippi River. After a few name changes it merged with the Milwaukee and Prairie du Chien in 1863 to form the Milwaukee and St. Paul. Prairie du Chien is a town in Wisconsin, named after a Native American chief named "dog" who lived in the prairie. It does not mean prairie dog!

In 1874 Milwaukee and St. Paul absorbed the Chicago and Pacific Railroad to form the Chicago, Milwaukee and St. Paul Railroad. They placed their company headquarters in the Rand McNally building in Chicago which was the first all-steel frame skyscraper. The railroad was the first to light its cars with electricity in the 1880s.

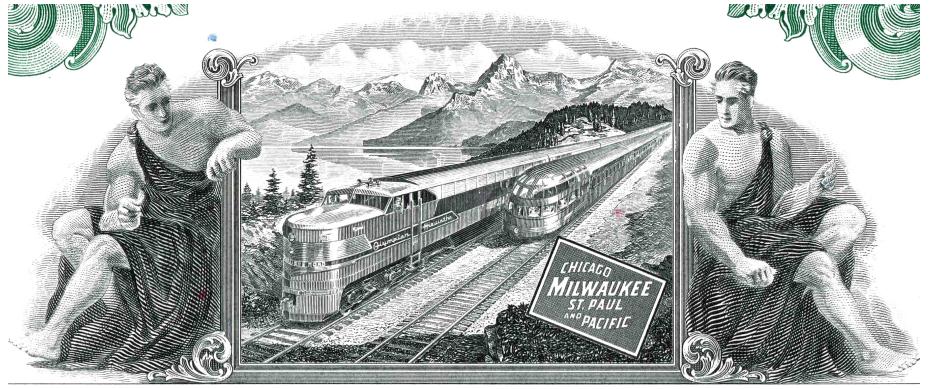


Rand McNally Building, Chicago, first all steel frame skyscraper 1889.



#8. Chicago, Milwaukee, St. Paul and Pacific Railroad stock certificate for 100 shares to Reynolds & Co. April 1970.

Hole and punch cancelled, and stamp cancelled on back. #2061.



Vignette of Chicago, Milwaukee, St. Paul and Pacific railroad. Two modernistic trains one with Milwaukee Road on front and Olympia Hiawatha on side, other with sky top car going in opposite direction. Mountains and forest in distance, mirror lake to left. Man either side.

In the 1890s they felt they could not stay competitive with the Northern Pacific without a Pacific extension, which they completed from 1905 to 1909 at enormous expense. In only three years, they built 2,300 miles of track over the Rockies & Cascades.



Much of their line paralleled the Northern Pacific Railroad, but they had to buy land and did not receive land grants. Their earnings bonanza stopped in 1914 when the Panama Canal opened.

Frigid Montana winters of - 40 degrees made steam generation difficult. But plentiful hydroelectric power led to an electric overhead system for 645 miles. This section was the largest in the world at the time and they used it to cross mountains. They projected the cost of electrification at \$60 million. The final bill reached \$257 million! Milwaukee Road sold bonds. But traffic never achieved profitability and they could not pay off the bonds. So, they declared bankruptcy in 1925. Three years later they reorganized as the Chicago, Milwaukee, St. Paul and Pacific Railroad with over 11,000 miles of track.

Intercity passenger operations included some of the best equipment for any railroad. In 1935 they introduced the Hiawatha, a streamlined express between Chicago and Twin Cities, which reached over 100 mph. It included "Skytop" cars and lasted till 1961.



Hiawatha, a streamlined express from Chicago to Twin Cities, started 1935.



Two Skytop lounges on the Hiawatha train.

When the Great Depression hit, they again filed for bankruptcy in 1935 and operated under trusteeship until 1945. In 1956 they converted to diesel. The Milwaukee then took over the Union Pacific's route from Chicago to Omaha. They sought a merger but the bureaucratic Interstate Commerce Commission (ICC) blocked the merger though agreed to another merger with the Burlington Northern in 1970. ICC granted Milwaukee Road Burlington Northern track rights so they grabbed 80% of the traffic from Puget Sound east till 1974.

But Milwaukee overextended itself and yet again went bankrupt in 1977. Like so many railroads it had too much track and too much rolling stock for its income.

After bankruptcy the Soo line acquired it in 1985. Soo is a phonetic spelling of Sault. Sault was a nickname for the St. Paul and Sault Ste. Marie Railroad, a subsidiary of Canadian Pacific. After a while all these details of which railroad took over another, begin to blur!

The Milwaukee Road Historical Association still exists in Illinois with annual conventions (this year is sold out!).

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watna Milwaukee Road Postkarte 1955.jpg

https://en.wikipedia.org/wiki/Chicago, Milwaukee, St. Paul and Pacific Railroad#/media/File:MI LW Map Updated.png



#9. Union Pacific Railroad \$5,000 Specimen Gold Bond at 4% interest, hole cancelled and stamped SPECIMEN, serial # 0000, unsigned, dated 1897 and maturing in 1947. #1899.



<u>Vignette from Union Pacific Railroad Bond, possibly designed by Thomas</u>
<u>Morris (1852-1898).</u>

This vignette of the Union Pacific bond shows the personification of America – an appeal to patriotic Americans to buy the bond. Stars on her armored breast piece represent the states. Laurel in her headpiece symbolizes victory. In case there is any doubt they spell out UNITED STATES OF AMERICA on a ribbon tied around an olive branch, representing peace.

Before the transcontinental railroad, crossing the US was a dangerous six-month trek. The first alternative was a steamer around Cape Horn. This took six weeks, and was dangerous and very expensive. The second alternative was an east coast steamer to Colon on the Atlantic side of Panama. You then crossed Panama to Panama City by dugouts and mule pack, a journey taking four to eight days. You risked malaria, yellow fever and more. You then took another

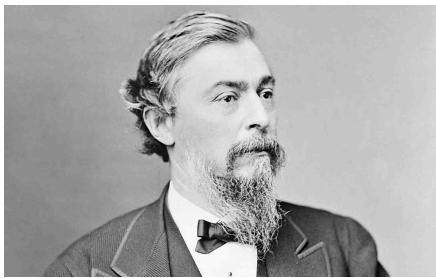
steamer to California. In 1855 the Cross Panama Railroad opened, slashing the risk and discomfort of the journey across the Panamanian isthmus.



Theodore Judah, Civil Engineer involved with Central Pacific Railroad.

In 1859 Daniel Strong, a storekeeper in Dutch Fleet, CA, wrote to Theodore Judah. Judah was a civil engineer obsessed with a transcontinental railroad, and laid out a route. Strong offered to show Judah a realistic route, which Judah's had not been. The two agreed and formed the Central Pacific Railroad Company. Judah then convinced four Californian businessmen (the "Big Four") to back them. Judah surveyed the route and presented his survey to congress in October 1861. The next year Congress and Lincoln passed the Pacific Railroad Act. In 1863 Judah sailed from California to New York to get financing but died from yellow fever on the rail journey in Panama.

Lincoln got to choose some of the details and decided on Council Bluffs, Iowa, just east of the Missouri River, as the eastern terminus of the transcontinental railroad.



Thomas Durant Physician turned businessman.

## The Credit Mobilier Scandal 1872.

Thomas Durant, a physician turned businessman, bought a controlling interest of over \$2 million of Union Pacific stock. He also started the Credit Mobilier company, an independent construction company who built for UP. The US Government paid UP \$32,000 per mile of track. But Durant unnecessarily increased the length of the tracks to line his pockets. Credit Mobilier also charged more than normal for their services to UP, further profiting Durant. They also bribed many Congressmen. In 1867 US Congressman Oakes Ames distributed cash bribes and \$9 million in discounted stock for favorable votes on UP's activities. Five years later the New York newspaper, *The Sun*, broke the story fingering 15 influential politicians, including the Speaker of the House, the Secretary of the Treasury, the Vice President, and Rep. James Garfield (later to be the US President).

The Central Pacific also had their own construction company with the same arrangement so the "Big Four" lined their pockets too. But they had no scandal!

### **Promontory Point – where the railroads met.**

In 1865 UP started at Council Bluffs, Iowa, on the eastern bank of the Missouri River. The bridge over the river cost \$1 million. They hired Civil War Veterans, many of whom were Irish. They did a good job.

By contrast the Central Pacific, who started from the California end, hired Irish laborers whom they shipped to California. But many left for the Nevada silver mines. So, they tried to get recently emancipated black slaves from Mexico. This failed too. They then petitioned Congress to release 5,000 Confederate prisoners. After that failed, they tried 50 Chinese laborers on a one-month trial basis. Despite their slight physique they turned out to be excellent laborers and developed great expertise in explosives and tunnel blasting.



Photograph of Promontory Summit, UP and Central Pacific Railroads joining up 1869.



The last spike, a painting by Thomas Hill 1881, depicting Promontory

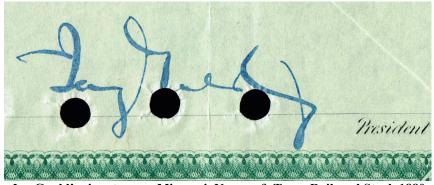
<u>Summit, note single Chinese laborer central left.</u>

UP faced Native American resistance, notably from the Sioux, Cheyenne and Arapaho tribes. Each railroad wanted to lay more track than the other to make their \$32,000 per mile. Both UP and Central Pacific managements egged their sides on. Finally, on May 10<sup>th</sup>, 1869 they met at Promontory Summit in west Utah. Celebrations were the order of the day. Manifest Destiny now encompassed the US.

Within five days of the golden spike at Promontory Point in 1869, UP ran a regular train service from Omaha, just west of the Missouri River, to San Francisco. In 1890 the famous "Overland Limited" luxury train made the same run in 71 hours, a journey of over 1,400 miles. Today the same journey lasts 44 hours on Amtrak and costs as little as \$124!



Route: red Central Pacific from west, blue Union Pacific from east, meet in Utah.



Jay Gould's signature on Missouri, Kansas & Texas Railroad Stock 1880.

The Panic of 1873 lasted from 1873 to 1879. During that time Jay Gould had been buying up UP stock on the cheap. By 1880 he owned a controlling interest. UP changed its name from UP <a href="Railroad">Railroad</a> to UP <a href="Railway">Railway</a>. UP then acquired a host of local railroads in Utah, Idaho, Colorado, Kansas, New Mexico and Texas. In 1893, during another Panic, <a href="UP Railway">UP Railway</a> declared bankruptcy and re-emerged as <a href="UP Railroad">UP Railroad</a> in 1897.

"Big Boy" UP steam locomotives became famous in 1941. Despite other railroads going to diesel, UP decided to use these jumbo steam locomotives. You can see a renovated Big Boy on YouTube called *Big Boy Steam Locomotive makes its way through Texas* in November 2019. Everywhere it goes hordes of people come to watch. UP took over the Missouri Pacific Railroad and several other railroads.

In 1998 UP merged with South Pacific becoming the Southern Pacific Transportation Company. Several railroads included the name UP but had differing lines after different mergers at different times. Freight traffic was 13 billion freight-ton miles in 1925, 33 billion freight-ton miles in 1960, and 74 billion freight ton-miles in 1979. By 1980 they owned 15,647 miles of track.



A massive "Big Boy" 4-8-8-4 locomotive 1962.

The UP railroad museum is in Council Bluffs, Iowa, now a suburb of Omaha, Nebraska, because that was the point chosen for the origin of the UP track westwards towards the Central Pacific.

UP still operates freight routes with 8,500 locomotives over 32,100 route miles. Even in 2007 they had over 50,000 employees. By contrast Wal-Mart, the largest private employer in the world today employs 2.1 million people.

The largest railroads today in the US (except Government-owned Amtrak for intercity passengers) are: UP (capitalized at \$17 billion), BNSF (Burlington Northern and Santa Fe) (\$16.8 Billion), CSX (Chessie-Seaboard merger) (\$10.6 billion), Norfolk Southern (\$9.5 billion), and Canadian National (\$8.4 billion).

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#10. Pacific Mail Steamship Co \$1,000 6% Gold Specimen Bond, 1890 maturing 1908. Hole cancelled & stamped SPECIMEN.



#10. Pacific Mail Steamship Co. 100 shares pre-1916. Hole & stamp cancelled, stamped SPECIMEN, serial #00000, unsigned.

#2245



Vignette from Pacific Mail Steamship Company Bond.



Vignette from Pacific Mail Steamship Co Stock cert. An iron steamer of 1870s, possibly represents SS China, SS City of Peking or SS City of Tokio (sic).

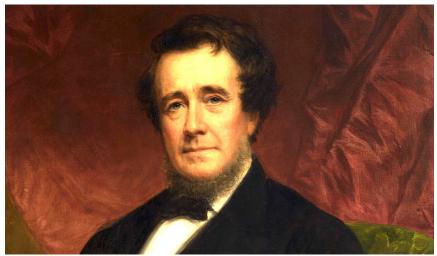
This vignette may represent the SS China, the SS City of Peking or the SS City of Tokio (sic). These steamships were built around 1874, at the time the largest vessels ever built, except for the British ship, the Great Eastern.

The Great Eastern, launched in 1858. It was the largest steam ship ever built – over four times the size of earlier ships. At 690' long and 32,000 tons it was the first double-hulled ship. It had four steam engines, side paddles, six masts of sail and a single screw. It ended up a financial failure. Cyrus Field, a US financier, bought it and used it to lay the first trans-Atlantic cable. He modified the ship with three iron tanks for 2,300 miles of cable, which were laid from Ireland to Newfoundland in 1866, the first trans-Atlantic cable.

The SS China weighed 10,200 tons, and the SS City of Peking and its sister ship SS Tokio weighed 5,000 tons. Iron hulled, they sported four masts, two funnels and main deck passenger accommodations. Presumably they are pictured on the stock certificate, as Pacific Mail Steamship (PMS) owned them.

PMS was one of only two non-railroad stocks in the DJTA. In 1847 Congress authorized the Secretary of the Navy to employ a mail steamship service every two months between New York City and Astoria at the mouth of the Columbia River. Arnold Harris won the contract for \$199,000 a year. He would soon sell out to William Aspinwall.

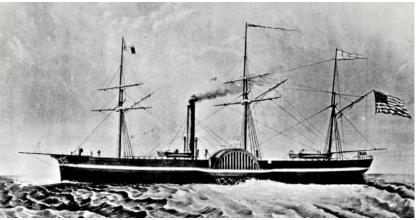
In February 1848 the US signed the treaty of Guadalupe Hidalgo with Mexico, which ceded California to the US. William Aspinwall and five other New York City merchants founded Pacific Mail Steamship (PMS). With the lucrative government contract of \$199,000 a year, this was a slam-dunk for an outlay of \$400,000! So, they raised \$400,000 and built three steamers. But the steamers ended up costing \$600,000. Congress, eager to develop Oregon Territory, prepaid \$199,000 (one year's mail) to cover their shortfall.



William Aspinwall 1807 – 1875, founder of PMS and Panama Railroad.

PMS launched the side-wheeler SS California, their first steamer, in New York City. It sailed round Cape Horn then ran between Panama City, on the Pacific coast, and San Francisco. The California gold rush started in 1849. PMS had no idea that gold had been discovered when they built their ships. In fact, the news broke during the first run of SS California on the west coast.

PMS owned two other steamboat lines. One ran between San Francisco and Sacramento on the Sacramento River. The other ran between San Francisco and Stockton on the San Joaquin River. George Aspinwall, William's brother, ran both lines.



SS California – the first PMS steamship in 1848.

By 1850 the capitalization of PMS increased from \$400,000 to \$2 million. They also wanted to establish an Atlantic line from New York City to Panama, but this competed with the US Mail Steamship Line. US Mail Steamship responded by running a Pacific line from Panama to San Francisco. Readers will have familiarized themselves sufficiently to know what happened next! Yes! PMS bought out US Mail Steamship in 1851! Monopolies were the rage!

Traffic continued by steamship on the Atlantic and Pacific sides. A mule pack traversed Panama taking a week or more risking death from malaria, yellow fever, cholera and more.

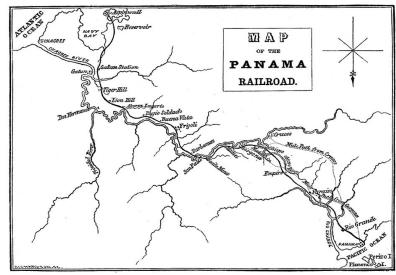
William Aspinwall, founder of PMS, decided they needed a cross-Panama railway. So, he founded the Panama Railway Co. He started the Atlantic terminus on a treacherous island of mangrove and poisonous manchineel trees. The Spanish call Manchineel "manzanilla de la muerte" (little apple of death). The fruit can be fatal if eaten, and the tree sap causes a highly irritant dermatitis. The *Guinness Book of Records* records it as the world's most dangerous tree.

Originally called Manzanillo Island, they renamed it Aspinwall Island. Today it is Colon. PMS used a steam-driven pile driver to build a terminus above the waterline in Aspinwall. They found a quarry near Porto Bello 29 miles away and loaded sandstone onto barges then towed them to Aspinwall for backfill.



1870 Stock Certificate for 10 shares at \$100 each dated November 1870.

As they built the railroad, the rail bed kept on sinking into the swamp, necessitating more and more backfill. After 20 months of work they had completed only 8 miles of track across the isthmus. Their original \$1 million of stock-raised money ran low. But, as luck would have it, in November 1851 a hurricane started, resulting in two nearby paddle steamers disgorging their 1,000 passengers, most of whom were desperate to get to the California gold fields. They willingly paid \$4 each plus \$3 per 100 lb. of baggage to be taken to the end of the 8-mile track. Although this raised only \$10,000, it was enough to stimulate more investors and construction continued. Each year, travelers happily paid increasing fares to travel increasing distances across the isthmus!

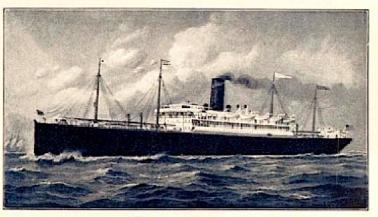


Route of Panama Railroad from Aspinwall (now Colon) to Panama City.

# PACIFIC MAIL STEAMSHI COMPANY

THE SUNSHINE BELT TO THE ORIENT

Steamers Leave San Francisco Every Week for HONOLULU-JAPAN-CHINA-PHILIPPINES



PACIFIC MAIL S. S. "MONGOLIA" -- ONE OF THE " BIG FOUR"

MONGOLIA 27,000 Tons

Twin Screws

MANCHURIA

27,000 Tons

KOREA 18,000 Tens

Twin Screws

SIBERIA

18,000 Tops

NILE, 11,000 Tons CHINA, 10,200 Tons Also \ PERSIA, 9,000 Tons

THESE MAMMOTH VESSELS, the largest and steadiest on the Pacific, afford every luxury, convenience and safety known to modern ocean steamship travel. Electric lights in each berth. Electric fans in each stateroom. Filipino Band Concerts every afternoon and evening. Cuisine under direct supervision of the world famous caterer, Mr. V. Moroni. Each ship carries an experienced sur-

# Around the World Tours

In Every Direction at Very Low Rates

NEW FEATURE TOURS AND TRIP DEPARTMENT

Write for Sailing Schedules, Cabin Plans, Descriptive Folders and Full Information

# PACIFIC MAIL STEAMSHIP COMPANY (PANAMA LINE)

NEW DIRECT EXPRESS SERVICE TO PANAMA

Fourteen Day Voyage from San Francisco. Semi-Monthly Sailings.

PMS advertisement 1915.

Finally, in January 1855 Panama Railroad Company completed the full 47 miles. It had cost \$8 million and 5,000 to 10,000 lives.

Wood rotted so quickly in Panama that they had to replace the pine railroad ties with lignum vitae, an expensive and heavy wood that did not rot. The wood was so tough they had to make pre-drilled holes and use a screw like spike. All wooden bridges were converted to iron. Today in Panama they still use a hard wood related to teak that will not rot.

In 1855 the railroad charged \$25 per person for the 47-mile journey which people were happy to pay. This would be like \$2,500 per person for a 47-mile journey today! Before the Panama Canal, the railroad was the world's most profitable. They made money from both freight and passenger sales.

By 1855 PMS had 18 steamers: some on the Atlantic side from New York City to Colon, and some on the Pacific side from Balboa (near Panama City) to San Francisco.

During the Civil War the Confederate Navy tried to attack PMS steamers carrying Californian gold. The Union responded by bottling up Confederate ports and ordering Union soldiers on all PMS steamers.



Pacific Mail Steamship Co advertising postcard showing a Chinese junk and a temple at Shanghai.

In 1865 the US government gave PMS \$500,000 a year for the mail route from San Francisco to Hong Kong. The same year PMS bought out the Atlantic Mail Steamship Co. for \$4.5 million. By 1866 their capitalization had increased from \$4 million to \$10 million.

The next year PMS started regular shipping to China, Hong Kong, and Japan. Again, capitalization increased to \$30 million (a 75-fold increase over 19 years). Soon, ships were going to Australia.

When the Union Pacific and the Central Pacific Railroads completed the transcontinental Railroad route in 1869, the profitability of PMS declined. But international shipments across the Atlantic and Pacific continued. People still used the Panama Railroad, though their profitability dropped.

The French tried building a Panama Canal from 1858 to 1869 but failed. They lost 22,000 lives to malaria and yellow fever. The United States constructed the Panama Canal between 1904 and 1914. The US lost only 5,609 lives because medical researchers by then had discovered the vectors of yellow fever and malaria, so were much better at preventing it. During American construction, they built a larger cross-Panama Railroad to help remove excavated soil.

The Panama Railroad was a separate company from PMS but William Aspinwall was the founding investor in both. Both companies cooperated with each other. PMS based itself in San Francisco so PMS stimulated San Francisco's development and helped it develop into a major city.

In 1925 the Dollar Steamship Company bought out PMS. In 1938 the US government bailed out Dollar Steamship Company. Their name changed to American President Lines, a privately owned company, which is now the world's third largest container transportation and shipping company.

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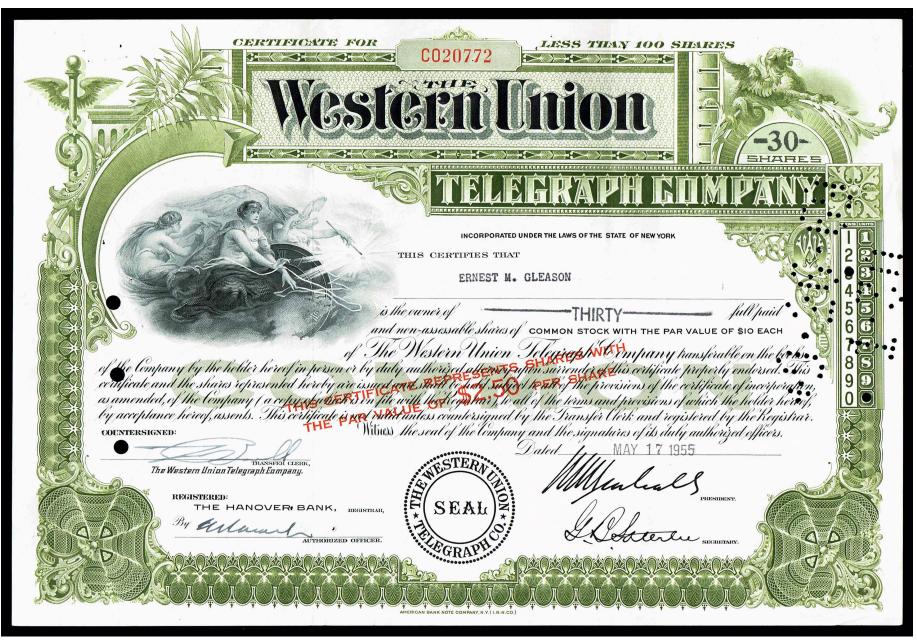
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#11. 30 shares of Western Union Telegraph Company to Earnest Gleason. May 1955. Punch and hole cancelled +9.26.69 1.30

Note also number matrix on right border with punching through 3 and 0 for 30 shares. #2827



Vignette of American Express Company vignette, possibly engraved by John Wallace Jr., (1923- ).

The vignette shows three ladies. One is in front of a clock signifying time. She holds a tape on which an automatic teleprinter will print a message. She also holds two wires coming together, perhaps representing a Morse key. An angel with wings holds a wand over a sunburst of light, maybe signifying the speed of light. Another writes a message. All three are in the clouds. I see their overall meaning as "we send messages electrically at the speed of light".

In 1800 Alessandro Volta invented the voltaic pile, the first continuously available electricity. Early telegraph experiments used one wire per letter. Others used an electromagnetic mechanism, often making compass needles turn.

In 1832 Baron Pavel Schilling invented an electro-magnetic telegraph. But he died before anyone could install it. Next year Carl Gauss invented an electromagnetic system, which the town of Munich installed in 1835.

William Cooke and Charles Wheatstone patented an electromagnetic telegraph system in Britain in 1837. As usual, they made compass needles point in specific directions using electromagnetic induction. The same year in the US Samuel Morse developed a telegraphy system using an electromagnet. This embossed dots and dashes on a moving paper tape. Morse sent a telegram over two miles using this machine in 1838. He then built a telegraph line 44 miles long from Baltimore to Washington DC. In 1844 he transmitted the message "What hath God wrought" (from the Bible, Numbers, 23:23). You can watch a three-minute video of Morse's tape on history.com by entering Morse code.

The first commercial telegraph was Cooke and Wheatstone's installed in 1838 on Britain's "Great Western Railway". (Although they called it "Great" it only ran for 13 miles west of Paddington in London!)

Morse installed his telegraphy system in US. It spelled the end of the Pony Express in 1861 after only one year in business.



Pony Express was a system of fast horse riders and stations across the US.

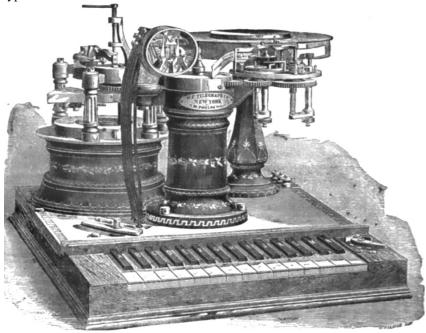


Morse Code Key Ca. 1900, right hand knob was pushed by thumb and 2 fingers

Samuel Selden and Hiram Sibley organized the New York and Mississippi Valley Printing Telegraph Company in 1851. Ezra Cornell started a second company called the New York and Western Union Telegraph Company.

The two companies merged in 1858 to form Western Union (WU). They bought out many smaller companies to set up a large telegraph network.

In 1855 David Hughes invented a printing telegraph. It used a 26-letter keyboard at each end, typewriters were not in production back then - keyboards looked more like pianos. Emile Baudot invented a printing telegraph, which typed out letters in 1874.



Phelps electromotor Printing Telegraph 1880 note 29-letter keyboard.



Hansen Writing Ball, the first commercial typewriter in 1865 in Denmark

Scholes and Glidden invented the first commercially successful typewriter, which had the QWERTY keyboard. In 1873 they sold it to Remington, an arms manufacturer.



Scholes & Glidden (Remington No.1) First commercially successful typewriter.

In 1863 Edward Calahan invented a Stock Ticker, which he sold to the Gold and Stock Telegraph Company four years later. Edison improved upon this, and Western Union soon bought the Gold and Stock Company.



Edison's Stock Ticker for the Gold and Stock Company.

In 1871 WU started a money transfer service. This used offices in most major towns in the US. One office could receive money and instruct another office to give out money. WU got out of the telephone business after they settled a suit with Bell Telephone Company. Money transfers became a major part of their business. In 1867 WU sent 6 million messages a year. By 1912 they were sending 120 million a year. In 1900 they owned over 1 million miles of telegraph wire, and two international seabed cables.

Frederick Creed, a Canadian who immigrated to England, invented the first teleprinter. In 1886 aged 15 he worked for Western Union and learnt telegraphy and Morse code. His teleprinter was a typewriter keyboard, which used compressed air to punch holes on a paper tape. After sending the message, a receiving perforator on the other end connected to another typewriter, which typed the message. He sold 12 machines to the British Post Office in 1902, and in 1906 sold his system to the Glasgow Herald newspaper.



Teleprinter machine, Teletype model 33ASR.

Creed then formed a company that made and marketed teleprinters to newspapers. By 1927 his machines typed 65 words per minute onto gummed paper tape. The next year ITT (International Telephone and Telegraph) bought his company. In 1923 WU had introduced teleprinters to network its branches. I recall as a student in Cambridge University, UK, in the 1960s, using their Teletype machine to type the same letter to a long list of people.

In 1935 TELegraph EXchanges (TELEX) started to connect teleprinters like telephones. WU built a TELEX network in the US. They used the network for weather reports, stock reports, newspaper stories, business communication, etc. They started intercity microwave communications in US in 1943.

The first user interface for the computer was the teleprinter, which predated the monochrome computer screen. In the 1970s home computer screens appeared making possible Apple's Graphic User Interface (GUI), rather than a simple typing display.

Because telegraphy only connected towns and big businesses, they needed WU messenger boys (usually on a bicycle) to deliver telegrams to people's homes. Later, people delivered telegrams by car. Telegrams were always rather expensive in UK where I grew up. Telephones were much cheaper. They still used telegrams in the 1960s and 1970s in UK as a formal way of congratulating newlyweds. People did this if the sender could not attend the wedding. The best man would read the telegrams after the wedding ceremony. WU sent their last telegram in 2006.

In 1964 WU replaced landlines with a continental microwave system. In 1974 they developed a set of communication satellites called Westar and leased them to other companies for video, voice and data transfer. In the 1970s they leased 0.05 Mbps high-speed telecommunication to the US government, to communicate with Europe and Hawaii. This became a beta substrate for ARPA (Advanced Research Projects Agency of the US Department of Defense), the forerunner of the Internet.

WU never got into the internet revolution. It certainly had the networks for businesses but it lacked home hookups. Instead they re-emerged as a money transfer business. In 1991 they changed their name to New Valley Corporation. First Financial Management Corporation acquired them, and then merged with First Data Corporation. First Data finally spun off Western Union as a separate company again. WU ended up as it started - as a money transfer company!

Millions of US immigrants still transfer weekly sums to their families in other countries using WU. In 2011 WU paid \$200 million to buy Angelo Costa, a money transfer group with 7,500 outlets in Europe. Months later they bought Travelex for \$840 million. WU has to be cognizant of money laundering which has got it into difficulties. Money transfer limits are \$300 to \$2,500 depending on location. Charges are 1%. The transfer takes minutes. MoneyGram, WU's biggest rival, charges 2%. WU still serves 150 million customers in over 200 countries with half a million agent locations. Surprisingly they make \$1 billion a year. WU have held on to their core competency. They started with today's equivalent of a cable network and have survived almost 170 years!

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# **CHAPTER FOUR**

# The First Dow Jones Industrial Average 12 Stocks in 1896 (Dow Dozen)

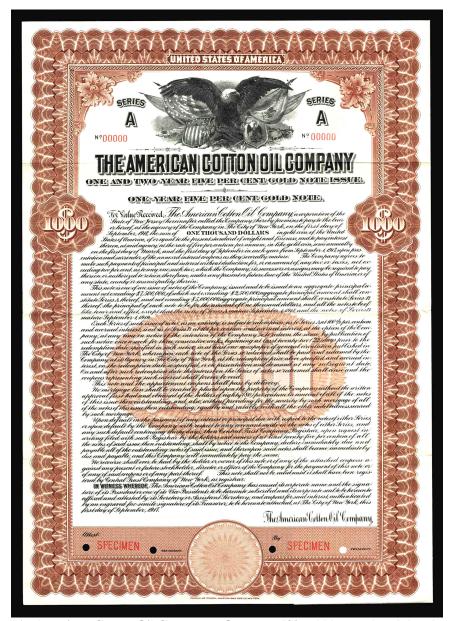
The twelve companies of the first DJIA in 1896 were:

- 1. American Cotton Oil (ancestor of Best Foods, now Unilever)
- 2. American Sugar (became Domino)
- 3. American Tobacco (became American Brands, now Fortune Brands)
- 4. Chicago Gas (became People's Gas now Integrys Energy)
- 5. Distilling and Cattle Feeding (became National Distillers)
- 6. Laclede Gas
- 7. National Lead (later NL Industries)
- 8. North American Company (dissolved by court 1946. Survivor became Wisconsin Energy and later WEC Group)
- 9. Tennessee Coal, Iron and Railroad Co (later bought by US Steel)
- 10. US Leather (dissolved in 1911)
- 11. US Rubber (merged into Uniroyal 1950s, then B.F. Goodrich, then Michelin)
- 12. GE



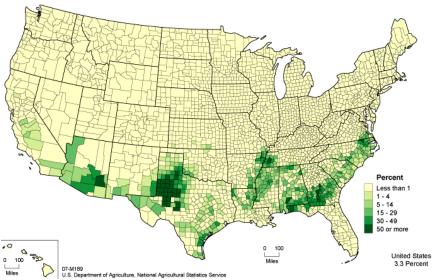
**Vignette of America Cotton Oil** 

The vignette shows a spread-winged eagle over an American shield. Below to the left is a stars and stripes flag, and to the right is a Mexican shield and flag. There are two other unidentified flags behind. On the left are industrial buildings. On the right are pack animals and a loading station. Below the eagle is a hammer, pickaxe and shovel, attributes of mining. This suggests Cotton Oil was doing business including mining in America and Mexico and perhaps other countries. But they were not! Thus, the vignette was likely a "stock vignette" i.e. one taken from a pattern book of vignettes of the Franklin Lee division of the ABNCo.



#1. American Cotton Oil Company. One-year 5% gold bearer bond dated 1917. Unsigned, 00000 serial # stamped Specimen and hole cancelled #1997.

The story of American Cotton Oil Company (ACO) is entwined with cotton, and its rise and fall in the US. Thus, I will give a brief history of cotton and its byproducts.

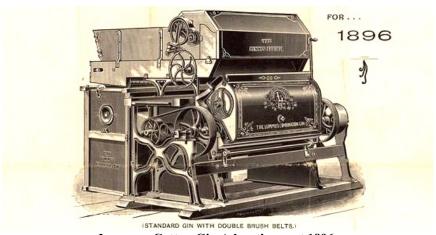


Acres of cotton harvested as % of cropland acreage 2007

Cotton grows well in Southern States. But separating the cottonseeds from the cotton was a tedious business until in 1793 Eli Whitney invented an engine ("gin") to separate them. His gins led to a doubling of US cotton output every decade from 1800 to 1860.

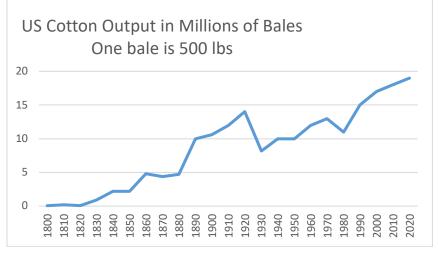


Early Cotton Gin.



**Lummus Cotton Gin Advertisement 1896.** 

From 1820 to 1860, 80% of all the cotton in the world came from the US. And from 1810 to the First World War (1914-1918), cotton accounted for 24 to 58% of all US exports, by far the leading export. Even today, the US is still the largest cotton exporter in the world, though India and China produce a little more than US but export less.



As you can see, production increased until the Civil War (1861-1865). After the Civil War production dropped slightly then rose, until the boll weevil took hold in the 1920s depressing production till 1930s, but only really increasing again after the governmental boll weevil eradication program in the 1950s. 99% of US cotton is short fiber or upland, 1% is long fiber or Pima.

Slavery made US cotton growing possible. It was backbreaking work in the hot summer sun, not something that most normal people would willingly do. I once

asked an African American patient what it was like picking cotton. She said only two words: "damned hot"! King Cotton was key in the antebellum Southern economy. Some say the Civil War would never have happened without the cotton gin.



The gin separates cotton into two components. For every 1 lb. of cotton there are 2 lbs. of cottonseed. The components of cottonseed are:

- Linters (short cotton fibers) 14%
- Oil 16%
- Meal 45%
- Hull 25%



**Boll** weevil

Cottonseeds some encased in linter, others not

Southerners treated cottonseed as a nuisance until the first successful US cottonseed oil mill in Natchez, Mississippi in 1834. Previously, ginning mills had been only too happy to let people haul away their seeds. In the 1850s cottonseed mills (often called cottonseed crushers or simply "crushers") increased. Suddenly, cottonseed products became valuable, especially the linters and oil.

Before drilled oil became available people used cottonseed oil as a lubricant, for lamps and in paint. George Bissell and Edwin Drake drilled the first oil well in Titusville, Pennsylvania in 1859. This ended the use of cottonseed oil as a lubricant and for lamps. In the 1860s people used drilled oil for lamps. In 1870 John D. Rockefeller incorporated the Standard Oil Company, and by 1882 he had a near-monopoly of US oil. However, in the 1880s electric lightbulbs replaced lamp oil.

Cottonseeds created one of the earliest large-scale industries in the south. In the 1870s cottonseed mills processed 80,000 tons of cottonseed; by 1902 they processed 3.5 million tons. Cottonseeds do not keep well, so most mills located close to cotton producing areas to decrease transport and wastage costs.

Crushers sold off linters for batting in mattresses, upholstery, textiles, surgical dressings, paper, and as a source of cellulose to manufacture early acetate fibers and other plastics. They sold the oil for salad oil, cooking oil, vegetable shortening, margarine, mayonnaise and cosmetics. Cottonseed meal is high in protein, and they sold it for animal feed, especially for cattle. They sold it as cakes or pellets. They used the hulls for roughage in feed and for fuel to run cotton mills. Crushers sold the leftover ashes as fertilizer and to make lye for soap. They used every part of the seed.

In the 1870s cottonseed overtook flaxseed as the chief vegetable oil in the US. In Italy they diluted olive oil with cottonseed oil - the first major market for the oil in the 1870s. The olive oil masked the cottonseed oil flavor. As soon as the Italians got wind of this, they imposed tariffs on imported cottonseed oil! Globalism did not exist then!

Emperor Napoleon III threw out a challenge to create butter from beef tallow to feed his armed forces and the lower classes. Frenchman, Mége-Mouries invented oleomargarine in 1869. He made a water-in-fat emulsion from beef fat to make oleomargarine (oleum is beef fat, margarite meant pearly luster). Butter is made from another water-in-fat emulsion from butterfat. In the medical field, we call a water-in-fat emulsion an ointment, and a fat-in-water emulsion a cream. My mother used to make delicious cream from butter by hand pumping molten butter with milk through a tiny hole thus changing it from a water-in-fat solid to a fat-in-water liquid.

In 1873 US cottonseed oil producers substituted cottonseed oil for animal fat creating the first vegetable margarine. When the US dairy industry got wind of it, they got their political cronies to put a stiff excise tax on vegetable margarine! But Europeans liked the product, and it sold well there.

In the 1880s companies diluted lard (pork fat) with processed cottonseed oil to make much cheaper "compound lard". Lard is not an emulsion; it is a solid fat. By 1890 compound lard consumed one third of US cottonseed oil.

By developing different uses for parts of the cottonseed, 26 US mills in 1870 grew to 45 in 1880. In the early 1880s Texas and Arkansas mill owners syndicated to set seed prices. In 1884 the syndicates combined to form the American Cottonseed Oil (ACO) Trust. Within two years they controlled 88% of all cottonseed mills.

A year after the Interstate Commerce Commission Act of 1887, the State of Louisiana sued the ACO Trust to dissolve them. The Act ruled that companies could only monopolize one state, not multiple states. So, the ACO trust simply reorganized as the ACO Company. They competed against the Southern Cotton Oil Company. But the ACO Company remained the largest in the US. By 1900 the US had 357 cottonseed oil mills.

Crusher mills worked on harvested seeds from August through March, often working 12-hour days, six days a week. From April to June they had a much slower pace, repairing the mill and readying the machinery for the next season. This gave the workers continuous employment and encouraged them to stay in the area assuring the mill of workers each year. Many workers were African-American and Mexican in the southern states where most of the mills were. In 1910 unskilled workers made \$1 a day and skilled workers \$2 a day. After World War I in 1919 their wages rose to \$2.25 and \$4.50 a day respectively.

The ACO Company only lasted in the Dow dozen from 1896 to 1900. It owned subsidiaries in 11 states, Montreal and Holland, as well as refineries, oil mills, soap factories, lard plants, gins, and fertilizer works and seed houses.

Examples of their products were: Cottolene (a mixture of beef suet and cottonseed oil), soaps, washing powder, various brands of salad oils and cooking oils. Plus, a mayonnaise called Hellman's on the East coast, and Bestfoods on the west coast. Proctor and Gamble bought a lot of cottonseed oil to make Ivory soap, and developed Crisco, the first vegetable-only shortening in 1912.

By 1910 the ACO Company recorded assets of \$38 million and earnings of \$2 million. US farmers for years preferred whole cotton seed to meal. So, the crushers exported their meal to European farmers whose animals loved it. Years later in 1910, Texas cattle ranchers started buying cottonseed meal to help their cattle survive harsh winters.

In the 1920s the boll weevil reached a critical mass. They reduced cotton output from 14 million to 8 million bales a year from 1920 to 1930. Pushed by George Washington Carver, an African American Professor of Agriculture at Tuskegee University, southern farmers turned to peanuts and soybeans for oil. By the 1940s they could extract vegetable oils with solvents rather than crushing. Most commonly, they used the solvent, hexane, derived from petroleum.

A subsidiary absorbed ACO Company in 1929. Three years later they changed its name to Bestfoods. They merged with Corn Products Company in 1958. Corn Products split into Bestfoods and Ingredion in 1997. Unilever acquired Bestfoods in 2000.



Cottolene beef suet/cottonseed oil mix.

Crisco cookbook 1912

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#2. American Sugar Refining Company 100 shares of common stock to Alexandra Ossorio, dated May 1957, hole and punch cancelled "FN 3 10 66 C". #2828.



<u>Vignette for American Sugar Refining Company by Alfred Jones and J.D. Smillie entitled "Sugar Cane Press" for ABNCo.</u>

Henry Herrick (1824-1906) designed this vignette, entitled "Sugar Cane Press" and J.D. Smillie and Alfred Jones engraved it. The oldest son of famous engraver James Smillie, J.D. Smillie (1833-1909) studied with his father. In 1862 after three years with the American Bank Note Company (ABNCo), J.D. Smillie declared engraving to be "an intolerable bore" and became a painter. Despite his comments, he engraved 38 foreign bank notes, and 18 securities.

Born in Liverpool, England, Alfred Jones (1819-1900) immigrated to the US. He studied at the National Academy of Design, and was elected an Academician in 1851. In 1857 he joined with W.C. Smillie and Francis and Charles Edmonds to form an engraving company that the ABNCo. absorbed in 1859. In 1866 US Bank Note Company appointed him President. He invented the forerunner of the halftone process. In 1901, aged 81, he went for a walk one day in Manhattan and a hansom cab struck him. He died later that day. He and J.D. Smillie engraved "Franklin and electricity" on the large size US \$10 bill. Jones engraved over 70 foreign bank notes and over 40 stock and bond certificates. Remember that the prime deterrent against counterfeiting in the 1800s and 1900s was superb artistic steel plate engraving.

The vignette shows the sugar cane harvest bought to the crushing mill and boiling house. Four oxen pull a cart of cut sugarcane while another cart is loaded in the background. Behind this, slaves cut sugar cane. On the left is a mounted white overseer. Behind him is the crushing mill and boiling house with high chimneys.

Sugar cane is indigenous to south Asia and Southeast Asia. Spaniards took the crop to the Canaries, and Columbus took sugarcane to Hispaniola (now Haiti and Dominican Republic). The Caribbean Islands were ideal for growing sugarcane. Cane needs a lot of water and sun, and cannot tolerate frosts. You plant it by placing a cutting with a bud in the ground. It grows continuously and can be harvested several times a year.

Sugar, previously affordable only for the rich, became increasingly available in the 1700s. Upper class Europeans knew that a few years on a Caribbean Island exploiting slaves and growing sugar cane could create a family fortune lasting for generations. Caribbean Islands were "the thing". France willingly exchanged Canada with England for three small islands: Guadeloupe, Martinique and St. Lucia, at the end of the seven-years' war in 1763.

Planters harvested cane several times a year and took it to rollers to crush it. From 1600 to 1800s they processed the extracted juice in boiling houses. Using up to seven copper cauldrons arranged in series, each is smaller and hotter than the previous one. They boiled the cane juice with lime to remove impurities in the first cauldron then transferred it to successive cauldrons with skimming between. Syrup from the last cauldron dripped into troughs where it cooled forming sugar crystals around a core of molasses. Slaves then shoveled raw sugar into hogsheads.

Tending and cutting cane and operating the boiling houses was a brutal job with frequent accidents. Only slaves did it. Owners often suspected accidents represented slaves wanting to commit suicide at their wits end. A slave with a machete stood beside the slave who fed cane into the mill, ready to cut off his arm in case it became trapped in the mill feeder. If the mill feeder's finger got caught, the mill pulled in his whole body and squeezed him to a pulp. If a slave got any of the scalding sugar on him, it stuck like glue often resulting in loss of the limb. In an already hot humid climate, tending the boilers often led to heat exhaustion, and more accidents. Planters used slaves because of their greater resistance to malaria and yellow fever than local Indians.



Interior of boiling house in Antigua, by William Clark London 1823.



Cut sugarcane.



Sugar plantation harvesting in Reunion late 1800s.

After the Haiti Slave Rebellion 1791-1804, Haiti sugar production declined. Cuba replaced Haiti/Santo Domingo as the biggest sugar producer in the world. Slavery remained legal in Cuba till 1886 helping sugar cultivation in Cuba.



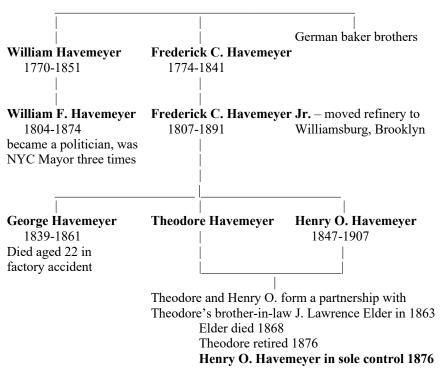
Battle of Santo Domingo (Palm Tree Hill) part of Haiti slave rebellion.



Triangular slave trade.

The first African slaves arrived in the Americas in 1510. In 1810 England abolished the trans-Atlantic slave trade that had been so lucrative. Twenty-three years later they ordered a gradual abolition of all slavery. The US abolished the trans-Atlantic slave trade. But dealing in slaves remained legal until emancipation in 1863. Brazil was the last country to abolish slavery in 1888.

The American Sugar Refining Company was the child of the Havemeyer family:



William and Frederick C. Havemeyer both came from Germany via Britain as bakers. They opened a sugar refinery on Vandan Street, New York City in 1805. In 1857 Frederick C. Havemeyer Jr. moved the refinery from NYC to Williamsburg, Brooklyn, by the waterfront. Frederick C. Havemeyer Jr. had three sons. George died when his clothing got caught in the crank of one of the refinery's large engines. The other two sons, Henry O. and Theodore went into business with Theodore's brother-in-law Elder in 1863. Their refinery did well. Elder died in 1868, and Theodore retired in 1876 leaving Henry O. Havemeyer ("Harry") in sole charge. He became known as "The Sugar King".

By 1887 the Havemeyers refined 68% of US imported sugar. Because of competition Harry formed the Sugar Trust in 1887 to control the price of sugar, and to control labor. He controlled the best 17 of 23 sugar refineries in US. By 1890 only five refineries (the most efficient) remained in the trust.

In 1891 after the Sherman anti-trust Act of 1890 the US government broke up the Sugar Trust. Instead, Harry formed the American Sugar Refining Company (ASRCo) as a holding company in New Jersey in 1891, which he controlled. In 1892 he invested in Cuba, buying land and sugarcane estates.



Henry O. Havemeyer "Harry" head of the American Sugar Refining Trust

In 1895 another suit started. The court was asked whether anti-trust law could prevent a manufacturing monopoly rather than a distribution monopoly. But the US Supreme Court allowed the ASRCo to buy out yet more companies. In 1896 ASRCo became one of the Dow dozen.

For another 20 years ASRCo bought out competitors. Harry did this by a price war with local refiners followed after a few years by a negotiated settlement. After all the price wars, weaker refineries became subjects for acquisition, which Harry did anonymously through sham companies. He then put the companies in his National Sugar Refining Company of New Jersey. Of course, the American Sugar Refining Company always controlled half of its stock.

Despite the 1890 Sherman Anti-Trust Act, many companies continued their monopolies for 10 to 30 years. In 1902 Harry expanded into sugar beet territories in Utah, Idaho, Colorado, Michigan and California. And by 1907 he controlled 98% of US sugar production.

The same year a disgruntled employee told the US Treasury Department that Harry was not paying his fair share of import taxes. Harry had had a special spring installed in the scales used to report import duties. With this, he could underpay duties. The US Treasury Department sued ASRCo who settled for \$2 million in back taxes. They convicted eight employees, but not Harry.

Harry died just two weeks after US special customs agents inspected his scales. He died aged 60 from acute peritonitis from a ruptured bowel.

His son Horace (1886-1956) took over, but from 1907 to 1921 there was a protracted legal battle with the federal government over its monopoly. In 1922 they announced a settlement. ASRCo designated Domino sugar as a successor. The government allowed Domino Sugar to remain as Domino claimed their control of refined sugar had dropped from 72% to 24%. Subsequently, the government prevented their habitual unfair business practices. Domino stayed in DJIA until 1930 when their competitors finally got the better of them.

In 1963 the American Sugar Company, part of the sugar trust, merged with ASRCo. This is confusing as some sources quote American Sugar Company as part of the DJIA. ASRCo was in the DJIA from 1894 to 1930. However, terminology seems loose. The American Sugar Company was a later company that merged with ASRCo in 1963. Domino had become a subsidiary of ASRCo from what I can understand. As you can see from the initial stock certificate, in this section, ASRCo was still alive in 1957, with N.F. Oliver as President. On the right is an American Sugar Co stock certificate from 1963 also signed by N.F. Oliver, President. In the 1970s ASRCo changed their name to Amstar Corporation and got into high fructose corn syrup.

Invert sugar is sugar heated in water with an acid like lemon juice. This splits the disaccharide, sucrose, into two monosaccharides, glucose and fructose. Fructose is sweeter than sucrose. Invert sugar is therefore sweeter than plain sugar. Corn syrup is mainly glucose, but can be treated to convert the glucose to fructose (high fructose corn syrup) making it sweeter.

A little history about Harry: Harry was a difficult child. Aged eight he fought with his school principal who expelled him from school. His formal education then stopped. Instead, he apprenticed in his father's business, learning all the secrets of sugar refining and being a merchant. Harry was no slouch. He compensated by voluminous reading. He married Mary Elder in 1870. The marriage was unhappy, and he divorced her in 1882. The next year he married Louisine (Mary's niece). During the gilded age people frowned on divorce. They even frowned on being friends with divorcees. So, the Havemeyers had a limited social life. Recall that when William Kissam Vanderbilt's wife Alva divorced him in 1895, he moved to France to avoid being shunned.

Harry developed into a self-driven man, workaholic, passionate about art and music, but with few friends. The press excoriated him for being "King Sugar" and his abusive business practices (which were par for the course in the gilded age). He became somewhat of an introvert.



American Sugar Co Stock Certificate 1963, note President Oliver same as ASRCo.

Harry practiced the violin three hours a day and held musical evenings for acquaintances in their New York City home. He owned two Stradivari and one Guarneri. The Havemeyers had other homes. One was Hill Top on Palmer Hill Road, Greenwich, CT built 1890. When Louisine died, the family had the home destroyed to reduce taxes and later sold off the land in parcels.

Harry loved art and collected oriental items. But Louisine, friendly with Mary Cassatt, the famous American impressionist painter, was much more of a connoisseur. She persuaded Harry to buy impressionist paintings. Their estate included over 2,000 art objects most of which they left to the Metropolitan Museum of Art in New York City.

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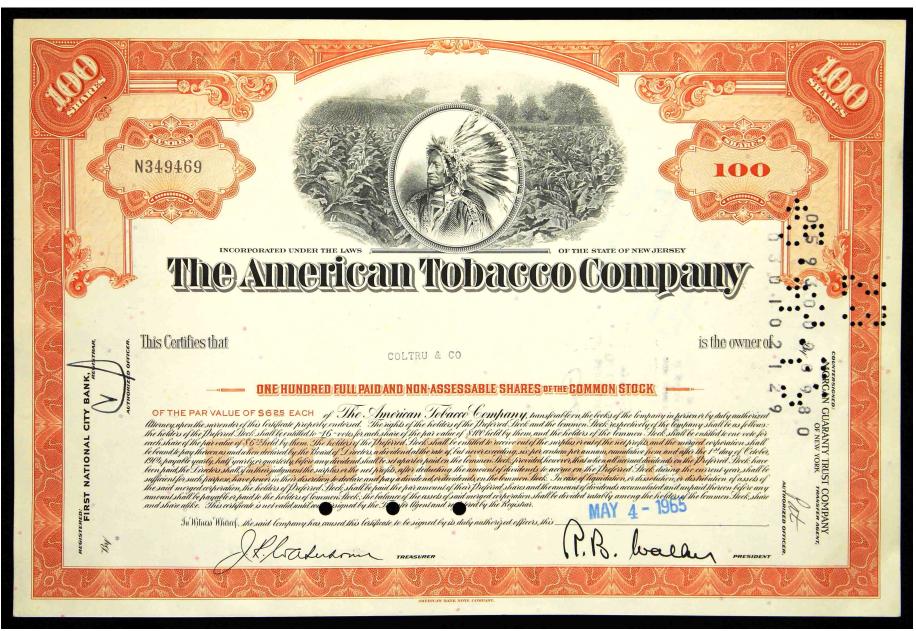
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#3. American Tobacco Company Stock Certificate for 100 shares of Common Stock to Coltru & Co May 1965.

Hole and punch cancelled. #1939.



Vignette entitled "Nicotina" designed by Henry Herrick, and engraved by

Charles Burt.

Henry Herrick (1824-1906) designed this vignette entitled "Nicotina". Although the bottom right says ABNCo, Charles K. Burt (1823-1892) did the engraving. Born in Scotland, Burt emigrated to US in 1842, becoming President of the Graham Art School in Brooklyn, New York. He worked for most of the large engraving companies; Rawdon, Wright and Hatch; British American BNCo; Western BNCo; and New York BNCo. He worked for 16 years for ABNCo, and 20 years for the Bureau of Engraving and Printing and executed significant engravings on 30 different pieces of large size US currency.



Sir Walter Raleigh showing smoking tobacco to British nobles in 1585, on back of a US \$2 Original Series National Bank note, engraved by Luigi Delnoce.

Native Americans introduced tobacco to Christopher Columbus in 1492. The Spanish started importing it to Europe in 1528. Jean Nicot, French ambassador to Portugal, sent his King, Francis I, tobacco. He included instructions on how to use it as a snuff. This reportedly cured the King's headaches. Botanists named it Nicotiana after ambassador Nicot. At that time Spain had the Caribbean tobacco monopoly so controlled the European market.

In 1584, during Virgin Queen Elizabeth's reign, Sir Walter Raleigh led an expedition to settle North America. He selected Roanoke Island, but the expedition failed. The next year Sir Walter Raleigh promoted tobacco's benefits, making it fashionable in Queen Elizabeth's Court (see engraving left). When King James I came to power in 1603, he opposed Raleigh and opposed tobacco. Tobacco changed from fashionable to foul. In 1607 more English adventurers settled Jamestown looking for gold. They found none. The settlement foundered until John Rolfe discovered how to cultivate tobacco.

Englishmen preferred the more fragrant and sweet Caribbean tobacco (Nicotiana tabacum) to the harsher native Virginian tobacco (Nicotiana rustica). So, in 1612 Capt. John Rolfe, a Jamestown settler, secretly imported Caribbean tobacco seeds to Virginia. He befriended a Caribbean cultivator who taught him how best to grow the plant in Virginia.

Jamestown's made their first tobacco shipment in 1617. By 1630 Jamestown was exporting 500,000 lbs. of tobacco a year. Within a decade exports tripled. Growing tobacco was very labor intensive. Tobacco growers could only use a field for three years, and then they had to lay it fallow for another three years. This pushed Virginians to expand farmland. Initially, indentured servants tended the tobacco. An indentured servant could sail free to Virginia if they agreed to be a servant for three years. Later, slaves tended the tobacco. Planters became wealthy with their cash crop. Plus, England had broken the Spanish tobacco monopoly.

American tobacco companies were like a game of musical chairs, constantly changing their names and ownership, merging and separating. James B. Duke ("Buck") (1856-1925) was the big daddy of American tobacco. Son of a tobacco farmer, he operated the first cigarette machine invented by James Bonsack. This made cigarettes sixty times faster than the most expert human. Duke developed an exclusive agreement with Bonsack, to make sure he beat his competitors.

By 1890 Duke controlled 40% of the entire US tobacco market, both rolled and unrolled. And like the rest of the robber barons what did he do next? Yes! He bought out his competitors! They were:

- Allen and Ginter, Richmond, VA
- Goodwin and Co. New York City
- W.S. Kimball and Co.
- Kinney Tobacco



James B. Duke ("Buck")

After the buy-outs, W. Duke and Sons controlled 90% of US tobacco. He formed American Tobacco Company (ATC) which listed on the NYSE in 1890 and became one of the 1896 Dow dozen. Duke later bought around 250 other companies! ATC became the tobacco trust!

Having monopolized the US market, Duke turned to the British market. He stuck skillfully to his core expertise, expanding vertically (buying up other cigarette manufacturers) rather than differentiating horizontally (e.g. expanding into retailing and tobacco growing). But the British knew what they were up against. So, many British companies merged into the Imperial Tobacco Company (ITC). ITC was too big for Duke to take over, so they agreed on a cooperative venture they called British American Tobacco (BAT), to control the rest of the world! My father bought shares of BAT in the late 1950s and I remember when I was 11 years old looking up their stock prices in the newspaper.

It was not long before the Sherman Anti-Trust Act of 1890 caught up with Duke. In 1907 the US Government sued ATC forcing them to split up. The case went to the US Supreme Court who dissolved them the same day they dissolved Standard Oil. The court split ATC into five companies:

- ATC
- Ligget and Myers
- R.J. Reynolds
- P. Lorillard
- BAT, which was the only company Buck continued to control.

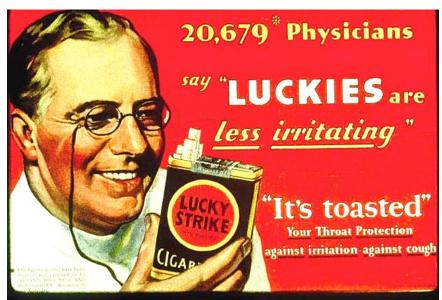
In 1892 James Duke and his brother Benjamin, bought land and water rights, and opened a textile factory in Durham NC. He later founded Duke Power (which became Duke Energy) to supply electricity to the textile factory.



**Duke Farms** 

Buck built Duke Farms, his place in the country, with over 2,000 acres exquisitely landscaped acres. In 1924, a year before he died, he established the \$40 million Duke endowment. Some of this went to Trinity College, NC, which they renamed Duke University. When Duke died, another \$67 million went to the same endowment, which supported several universities, hospitals, children's homes and churches. He left another \$100 million to his only daughter, Doris, which made her "the richest girl in the world".

In the 1940s, two British men became interested in medical statistics. The first, Sir Austin Bradford Hill, became Professor of Medical Statistics at the newly formed London School of Tropical Medicine and Hygiene. He pioneered the first randomized clinical trial (of streptomycin to treat tuberculosis). Ironically, he could not attend medical school because he had tuberculosis! The second, Sir Richard Doll was a physician and director of the statistical research unit at the Medical Research Council (equivalent to the National Institute of Health in US).



Advertisement Wall Street Magazine 1930.



Sir Austin Bradford Hill.

Sir Richard Doll.

Hill and Doll published a paper in the British Medical Journal in 1950 showing people who smoked over 25 cigarettes a day had 50 times the risk of lung cancer. Additionally, they linked smoking to heart disease. After this Doll himself stopped smoking.

James Duke did not smoke. In the 1950s 44% of US people smoked. Today 18% smoke, but it has taken so long for the message to be assimilated by the public and by the medical profession. I recall at medical school in Oxford where Doll had been appointed Professor of Medicine, many senior academic physicians were still smoking in the early 1970s.

In the 1950s tobacco companies started advertising the tar content of cigarettes, showing how their marvelous filters reduced tar content. The FTC directed tobacco companies to stop advertising tar and nicotine content. The 1964 US Surgeon General's report on smoking and health excoriated the tobacco companies. From 1954 to 1994 over 800 people sued tobacco companies for cancer, death and other wrongs. Big Tobacco won every case.

Then in the 1990s came a massive suit from the National Association of Attorneys General. The four major tobacco companies knew they wanted to limit their exposure. So, they joined forces and petitioned Congress for a global resolution.

The four "Majors" were:

- Philip Morris
- R.J. Reynolds
- Brown and Williamson
- Lorillard

In 1994 four states settled with the majors for \$35 billion. The rest of the 46 states, DC, Puerto Rico and Virgin Islands settled in 1998. They called it the MSA (Master Settlement Agreement).

They called the four "majors" OPMs (Original Participating Manufacturers). OPMs controlled 97% of the US market. Later 41 other tobacco companies, who also wanted to limit their liability, joined the MSA. They called them SPMs (Subsequent Participating Manufacturers).

MSA is the largest litigation settlement in US history. In 1998 courts awarded \$206 billion over 25 years. They allocated escrow funds to each state, who agreed to pay tobacco related health care costs for Medicaid patients. The MSA freed OPMs and SPMs from class action suits, and capped individual litigation. In return the OPMs and SPMs paid \$13 billion up front. They paid another \$9 billion a year in perpetuity (proportional to cigarette production and inflation) for tobacco related medical costs. Further, they paid \$9 billion for a strategic contribution fund, and \$1.5 billion a year to the National Association of Attorneys General. The four majors agreed to stop certain marketing practices and fund the "Truth Initiative" i.e. an anti-smoking campaign.

This generated a lot of excitement that smoking would plunge. But it did not. Much of the money just went into state coffers. They used it to pay other state expenses and did not fund anti-smoking campaigns as they promised.

Although MSA exacted significant retribution from the tobacco companies, they lost the political opportunity to curb smoking. And they did not cripple them enough. In another ruling in 2006 Judge Gladys Kessler said tobacco companies were still hiding health risks and still marketing to children. In 2009 the US Court of Appeals agreed and found tobacco companies liable.

Musical chairs continued with tobacco companies. In 1994 BAT acquired ATC, bringing Lucky Strike and Pall Mall to BAT's US arm called Brown and Williamson. Then in 2004 Brown and Williamson merged with R.J. Reynolds to become Reynolds American, and in 2015 bought out Lorillard. In 2017 BAT took over Reynolds American. BAT/Reynolds' headquarters are in London, UK. They became the largest publicly traded tobacco company in the world, operating in 180 countries. It is capitalized at \$75 billion. The price-earnings ratio is 1.86 i.e. revenues of \$40 billion!

The medical risks of smoking are:

- 480,000 deaths a year in US (a fifth of all deaths in US).
- Smoking has killed ten times more US people than all American war deaths combined.
- Smoking causes 90% of all lung cancer deaths (the commonest cancer), raising the chances 25-fold, and causes 80% of all COPD deaths.
- Smoking triples the risk of dying from coronary artery disease and stroke.
- Smoking increases the risk of cancer of the lung, breast, colorectal, bladder, esophagus, larynx, tonsil, stomach, kidney, liver and pancreas.
- Smoking in pregnancy increases the risk of prematurity, stillbirth and low birth weight.
- Smoking increases osteoporosis and dental disease. It increases the chance of diabetes 30-40%, and increases the chance of rheumatoid arthritis.
- Stopping smoking substantially reduces all the above risks.

With this background you can understand why physicians are so jaundiced about electronic cigarettes (e-cigs). Americans spent \$3.6 billion on them in 2018.

Sales have grown at 24% a year. Economists predict worldwide sales of \$43 billion by 2023. An e-cig or "vaping" offers an easy entry for underage kids to become addicted to nicotine. Most children do not even think e-cigs contain nicotine! Vaping remains largely unregulated.

A Chinese pharmacist, Hon Lik (whose father died from lung cancer) invented e-cigs in 2003. Even today most e-cigs come from China. Battery powered heating elements vaporize solvents at 300°F to 600°F. The two main solvents (propylene glycol and glycerol) produce carcinogenic compounds at these temperatures. God knows what cotton candy and licorice flavorings do!

Statisticians say 20% - 30% of high school students vape. They are attracted by flavors like Tutti Frutti, cotton candy and sour gummy worms (reminiscent of the cartoon camel to attract kids to smoke camels). I asked my High-School-freshman grandson about his experiences with e-cigs. It was quite illuminating. He said 90% of kids use them at his school. JUUL is the commonest brand name, about 4" long. You buy pods, which insert into the unit. By contrast, most vaping units are about 8" long and you fill them with straight juice. Both products accept flavors, nicotine and liquid marijuana. If you fill the pods with your own juices, kids call it "third party". "First party," means buying the contraption. "Second party" means underage kids getting the contraption from someone else. Liquid marijuana is illegal in many states but often available in the back of vape shops and from the dark web.

Almost 70 years have passed since Hill and Doll's pioneering work exposing the hazards of smoking. Similarly, decades will pass before society understands the hazards of vaping. By 2020 in the US, 55 vapers died and over 2,500 were hospitalized for EVALI, (e-cigarette Vaping Acute Lung Injury) possibly from Vitamin E acetate added to marijuana liquid.

Will vaping increase or decrease smoking? If you already smoke, switching to vaping will likely decrease your mortality. But if you do not smoke vaping is not good for you. Brazil, Singapore, and Norway have already abolished e-cigs. Despite its hazards, smoking will continue in the US, and will become even more common in undeveloped countries. And now a generation of nicotine dependent children may start smoking. Yet another public health disaster.

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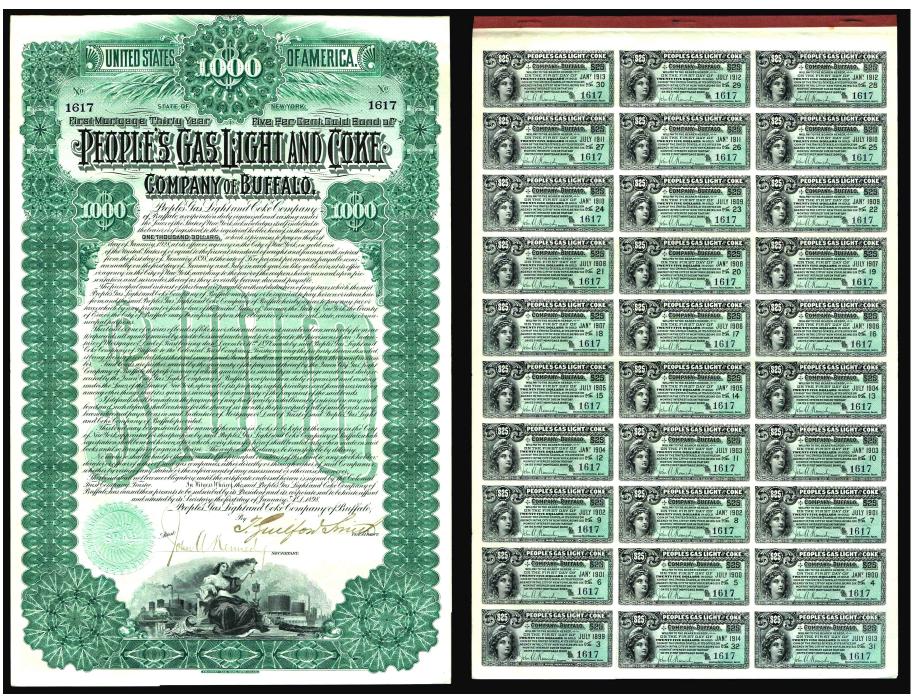
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#4. People's Gas Light and Coke Company of Buffalo, who bought out Chicago Gas.
\$1,000 5% gold 30-year bearer bond dated 1898. Uncancelled. Coupons say pay bearer. #2104



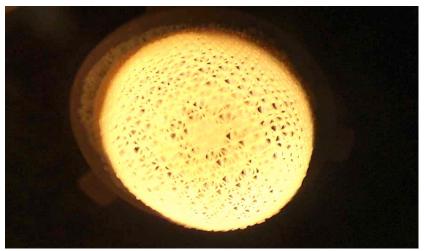
Vignette from bond.

The vignette shows a seated lady holding a burning torch. Behind her, on the waterfront are gas works and gas storage units (called gas holders or gasometers). There are two fancy gaslights behind her. She must be the Goddess of gas lamps! Today gasometers are used to create the correct pressure into gas pipes. They fill the bottom with water and an inverted half cylinder sitting on top contains the gas under pressure from the cylinder's weight. Today most storage is as a compressed gas.

In the early 1800s people knew if you heated coal in a low-oxygen setting it produced coal gas and coke. Coke burned cleanly. It had higher energy density, being almost all carbon. When it combusted with oxygen it formed carbon monoxide then carbon dioxide. Coal gas contains methane, hydrogen, carbon monoxide and other volatile hydrocarbons. The London Gaslight and Coke Company in England produced the first coal gas in 1812 for street and house lighting. Coal gas was to candles what mains electricity was to batteries.

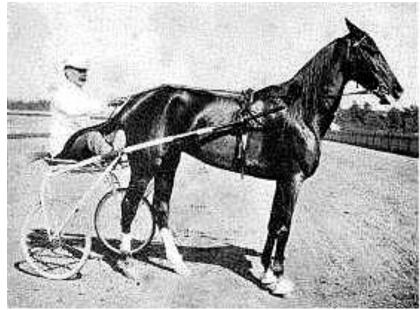
In the 1820s theaters directed gas flames on quicklime (Calcium oxide) creating a bright light called limelight. In the 1890s electric lights came of age. Gas companies had two responses to this. First, the Welsbach mantle, which markedly increased the efficiency of gas lighting. It made the light even brighter than electric lights. Welsbach invented his mantle in 1890. Successful production started two years later. They coated fabric with radioactive thorium dioxide. People's homes had negligible radioactivity exposure from them. But the factories that made them were a different story. People did not understand radioactivity at the time. Gas companies' second response was to diversify into cooking and heating.

Chicago Gas Light and Coke Company started selling gas for lighting in 1850 in Chicago. People's Gas Light and Coke (PGLC) chartered the company in 1855. Delivery started in 1862.



Welsbach mantle, fabric soaked in thorium dioxide.

Cornelius or C.K.G. Billings (1861-1937) joined the company aged 17 as a laborer. After nine years CKG took over the company's presidency from his father, the principal investor. A dynamic fellow, he merged with 12 other gas companies in 1895. By 1897 PGLC sold more gas stoves than anyone else. The next year Billings merged with Chicago Gas, the largest of his acquisitions. Organized in 1887, Chicago Gas entered the Dow dozen in 1896. I could not find a stock certificate of Chicago Gas. But after only two years in the DJIA, PGLC took it over, replacing it in the DJIA, so it was only around a short time.



C.K.G. Billings with his horse Lou Dillon after winning Webster Cup 1903

In 1893 CKG Billings served on the board of the World's Columbian Exposition. He loved athletics and horses and started the Chicago Athletic Club. Aged 40 in 1901, Billings retired from day-to-day management of PGLC and moved to Manhattan. There he fulfilled his hobby of sulky racing (one-man two-wheel carriages pulled by a horse). He built an elaborate 25,000 square feet no-expense-spared stable with all facilities for his 75 horses with 25 employees.



Billing's horse dinner party.

In 1903 he gave a dinner party on horseback for 36 of his friends in a grand ballroom on the fourth floor of Sherry's restaurant in New York City. He rented and painted it to look like an English country estate. The horses were docile and brought up to the fourth floor by elevator. They covered the floor with turf. Riders ate from a specially made silver tray attached to their saddles. They sucked iced champagne through rubber tubes from bottles in their saddlebags! The dinner concluded with a private vaudeville show. The bill? \$50,000!

The stables came first. After that Billings built a mansion called Tryon Hall. He built it like a Louis XIV Chateau, next to his stables and included a swimming pool, bowling alley and squash court. He kept his custom-built 232' yacht "Vanadis" nearby.

In 1917 he sold the estate to J.D. Rockefeller Jr. who gave it to the city of New York as Fort Tryon Park. Tryon Hall burnt in 1926, but the granite arches on the cliff edge are still there. Billings also built another grand estate "Farnsworth" on Long Island, then moved to Santa Barbara, California, where he built yet another mansion "Asombrosa". Other mansions followed.

In 1911 Billings helped found Union Carbide and became Chairman of the Board. Six years later it merged with the National Carbon Company to become Union Carbide and Carbon Corporation. They found an economical way to make ethylene from natural gas. This was the beginning of the modern petrochemical industry. After ten years of ill health Billings died in 1937.



Billing's Tryon Hall in upper Manhattan now part of Tryon Park.



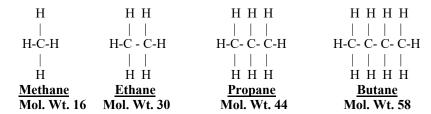
Tryon Hall.

In 1913 Illinois formed the Illinois Public Utilities Commission to regulate PGLC, which was a local monopoly. By the 1920s PGLC delivered 22 billion cubic feet of gas a year. They owned 3,100 miles of street mains. They still made gas from coal and oil, using 700,000 tons of coal and 77 million gallons of oil a year. In the late 1920s natural gas became plentiful in Texas, and in 1932 PGLC built the first long-distance high-pressure steel pipeline for natural gas from Texas to Chicago – 980 miles long.

By 1950 PGLC had \$80 million in sales and 4,500 employees. In 1963 they merged with North Shore Gas Company. They changed their name to People's Energy Corp in 1980. In 2000 they grossed \$2 billion and employed 3,000 in Chicago. In 2007 Integrys Energy Group bought People's Energy Corp and in 2015 Wisconsin Energy Corp bought Integrys.

So, the sequence was PGLC ->People's Energy ->Integrys ->Wisconsin Energy.

Today companies use natural gas rather than coal gas. Natural gas is found in underground rock formations often close to petroleum. It contains around 80% methane, and 20% ethane, also propane, butane, and other gases. The formulae of these gases are as follows (molecular weight is below):



The atmosphere is 78% nitrogen, which has a molecular weight of 28. Thus methane (which composes 80% of natural gas) is lighter than air and rises to the ceiling if it leaks. Propane being heavier settles to the floor or cellar if it leaks.

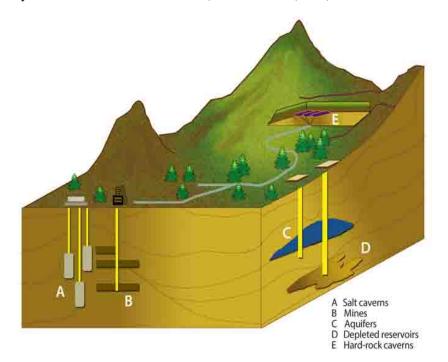
Experts can isolate each of these gases from natural gas. They use ethane to produce ethylene, which is used as antifreeze and to make plastics.

They convert propane to LPG, which I always thought stood for Liquid Propane Gas. But it does not: it stands for Liquefied Petroleum Gas. Used as a transportable liquid for home, trailer and barbecues, propane has more carbon atoms, hence is more energy dense. One cubic foot of propane produces 2,516 BTUs whereas one cubic foot of natural gas produces only 1,030 BTUs. They sell LPG by the gallon in easily transportable containers. They sell natural gas by the cubic foot through pipes connected to people's houses. A regular 5-gallon bottle of LPG for your barbecue is equivalent to 413 cubic feet of natural gas. Actually, LPG contains a bit of butane too.

Butane is even heavier and more energy dense. It is used for cigarette lighter fuel, camping stoves, and as a propellant for aerosols. It is also used to make butadiene for synthetic rubber.

Energy companies store natural gas in the reservoir whence it came, just as they store oil in capped wells. They can also store natural gas in depleted reservoirs, in aquifers, in salt caverns or as LNG (Liquid Natural Gas). With thousands of miles of pipes for natural gas, they can increase the pressure in the pipes to store gas. This is called line packing, which acts as a pressure reservoir for home use.

In times past gasometers stored coal gas. They do not store natural gas in gasometers. It can be liquefied, but is an expensive process, needing storage at 270°F. Specialized refrigerated boats transport it around the world, but they need special docking facilities. President Donald Trump wants to sell LNG to Europe, but Russia's Gazprom has a network of pipelines making it far cheaper. After liquefying and transporting, LNG is more expensive than pipeline delivery. Russia's Gazprom supplies nearly all the natural gas to Estonia, Latvia, Bulgaria, Slovakia and Finland. Russia has just completed a second pipeline to Europe, increasing Europe's dependence on Russian natural gas. They supply 40% of natural gas to Europe as a whole. Poland and Lithuania have built LNG terminals to receive LNG from other countries. The main buyers of American LNG are Mexico, South America, Asia, and Iberia.



Model showing different storage methods for natural gas.



LNG ship keeps LNG at - 260 degrees Fahrenheit.



Old "gasometer" like a cup with water and a smaller inverted cup above with gas inside. The upper inverted cup's weight creates the gas pressure.

# Natural gas production and delivery

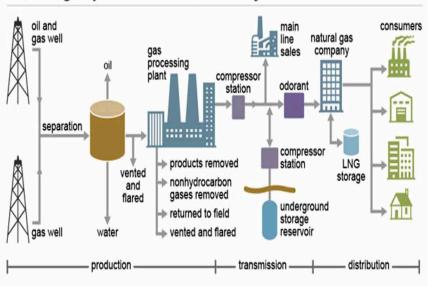


Diagram showing how natural gas is produced transmitted and distributed.

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https://en.wikipedia.org/wiki/LNG carrier#/media/File:Methanier aspher LNGRIVERS.jpg



#5. Illinois courts placed Distilling & Cattle Feeding Company in receivership in 1893, and American Spirits Manufacturing bought them in 1895. This is an unissued specimen preferred stock certificate dated 189-, unsigned and stamped SPECIMEN, with the serial number 00000 and hole cancelled. Initial shares were \$100 with \$35 million capitalization. Note numbers at base, which were punched to say number of shares. #2474.

In 1790 the federal government imposed their first domestic taxes - on whiskey. This led to the Whiskey Rebellion the next year. They taxed it at 9 to 11 cents per proof gallon i.e. the equivalent of 100° proof (50% alcohol). During the Civil War the tax rose gradually to \$2 a gallon, and by 1890 the tax settled back down to 90¢ a gallon. Although they usually drunk it, they also used it as a cooking fluid, in varnishes, perfume, and patent medicines.

# First some basics:

Distillers make spirits from different fermented grains. Fermented then distilled corn makes bourbon, barley makes whiskey, sugar byproducts (like sugarcane juice or molasses) make rum, rye makes rye, and grapes make brandy. Distillers make gin and vodka from different fermented grains like rice, rye, corn, sorghum, wheat, potatoes, etc. They may add juniper and/or other botanical flavorings to gin, and a little sweetener to vodka.

When I visited Cuba a few years ago, I was amazed to discover the different flavors of rum. They produced rum that was 1, 2, 3, 5, 10, 15, 20 and 50 years old. The 1 to 3-year-old stuff was clear, cheap, and tasted like rough rum, used as a mixer in drinks. But the 10-year-old stuff tasted and looked like a fine whiskey and was expensive. I mention this to illustrate a point about straight whiskey versus rectified or neutral spirits.

Distillers produce whiskey from malted barley. Malting is a process producing the simple sugar maltose that will convert to alcohol when fermented with yeast. After fermentation they distill it to make an undrinkable spirit containing ethanol and fusel alcohols. The word fusel comes from the German fusel, which means bad liquor. Fusel alcohols contain chiefly amyl alcohol, and other organic chemicals that taste awful and give you a hangover. There were then four paths to make a drinkable spirit:

- 1. Producers can store the spirit in charred barrels for 1 to 10 years. This converts the fusel alcohols to organic ethers, creating a more sophisticated tasting and smooth drink called <u>straight whiskey</u>.
- 2. Producers can re-distill the spirit into <u>rectified or neutral spirit</u>. This has much less fusel alcohol, and much more ethyl alcohol. But it has no flavor. The whiskey trust produced mainly rectified spirit.
- 3. Producers can mix straight whiskey with rectified spirits, to make cheaper whiskey. This blending process also makes a more consistent product, which they call <u>blended whiskey</u>.
- 4. Even in the late 1800s, chemists knew most of the constituents of the various spirits. Thus, producers could make rectified spirit into gin, whiskey, rum, etc. simply by adding other chemicals. Not only that, they could even imitate a 10-year-old barrel-aged whiskey and a 2-year-old barrel-aged whiskey.

So, to move on with our story, let me introduce Peoria, Illinois. Peoria is the largest town on the Illinois River. It had access to lots of pure water and to locally grown barley and corn. It also had excellent railroad links around the country.



Location of Peoria, Illinois on Illinois River.





Panoramic views of Peoria 1911, note wide river in background.

People in the 1800s considered Peoria the whiskey capital of the world. In the early 1870s H.B. "Buffalo" Miller formed the Peoria Pool. He asked distilleries to limit production. But this met with limited success - they already produced three times what people consumed. In the late 1870s a drought in Europe led to a shortage of grain and of whiskey (read rectified spirit). So, the US exported a lot of whiskey there. Problem solved.

Well, not quite! Within a few years the US again could not sell all their whiskey. In 1881 Miller formed the "Western Export Association" to export the excess whiskey to Europe at a loss. He again tried to limit each distillery's production. This did not work. The next year the pool closed because some distillers refused to pay dues. When Miller's Peoria pool reopened, they found it cheaper to pay specific distilleries to stay closed than to persuade all distilleries to decrease production.

In 1882 J.D. Rockefeller created the Standard Oil Trust to circumvent laws that prohibited a company in one state owning stock of a company in another state. (This is why companies incorporated in a specific state). Rockefeller (or more likely his lawyers) had an idea: a separate company would incorporate in each state. They would then assign their shares to a single trust that issued each company shares in their trust. Trustees would then direct all the business of the companies and appoint managers in the companies of each state.

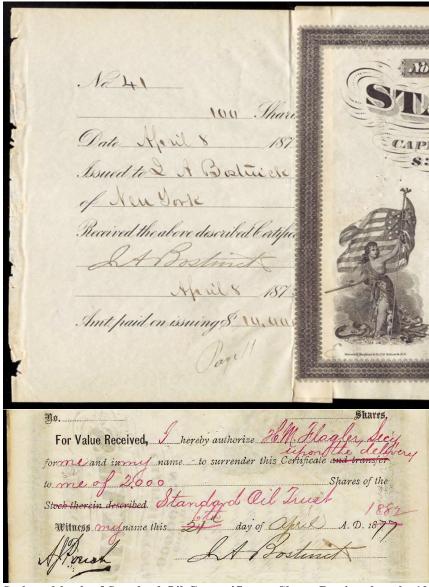
Joseph Greenhut started the Great Western Distilling Company in 1881, the world's largest distillery at the time. He later became President of the Whiskey Trust. In 1887 the pool decided on a trust like Standard Oil. They organized in Peoria, IL in 1888. Although they called it the Whiskey Trust the full name was the Distilling and Cattle Feeding Trust. The sour mash grain residue after fermenting and distilling they dried, and fed to cows, hence the name Distilling and Cattle Feeding. The trust appointed nine trustees, each with a \$100,000 bond. Only members of Miller's Peoria pool could join.

They set up the trust for 25 years. After that they could dissolve it by a twothirds vote of certificate holders. Each trustee had to own 500 trust shares. And each trustee had to own the majority of the shares within his own distillery corporation.

Shares totaled two to three times the value of all distilleries. They therefore considered the stock "watered down". Owners paid \$100 a share for Distilling and Cattle Feeding Trust Certificates. By March 1888 their value fell to \$50, and by April 1889 to \$34. These stocks did not trade on any stock exchange but you could buy it from brokers in Chicago, New York, Peoria or Cincinnati.

The Trust attracted distilleries by several devices. They paid them cash by overvaluing trust certificates and paying dividends. They hired principals as "managers" even in defunct distilleries, and paid them high fees. Previously they made less from exporting the whiskey than it cost to make. Now the trust limited production though they could still export it if they made a profit.

Eighty distilleries joined the trust. Only twelve stayed running. Only the most efficient and best located remained running, to decrease transport costs. For example, one in Cincinnati, one in St. Louis, one in Kansas City, etc. This reduced the cost of management and operations. The trust's twelve distilleries then paid dividends to all 80 distillery owners of stock. The trust also built an extra-large distillery at St. Paul for economies of scale. When a non-pool distillery (i.e. not a trust member) increased output, the trust decreased whiskey prices to break them. They preferred forcing them out of business to buying them out.

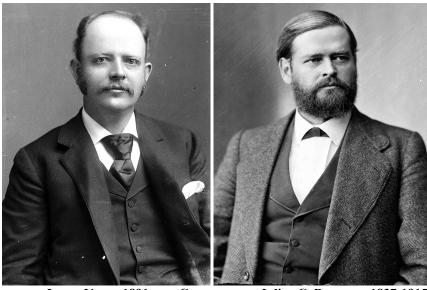


Stub and back of Standard Oil Co certificate. Shows Bostinet bought 100 shares in Standard Oil in 1875 for \$10,000, exchanging it for 2,000 shares in Standard Oil Trust in 1882. This was how companies got around monopolies.

Further, the Trust voluntarily increased payment for barrels and coal, which they had not done before. So far, so good. They sounded like a nice bunch! Well, not so fast! Shufeldt & Co of Chicago remained an important rival. Shufeldt discovered a spy in their employ, whom they ejected. He found someone had tampered with a valve, potentially causing an explosion. They fixed that too.

Shufeldt still refused to join the Trust so, like the mafia, they dynamited his distillery. No charges were ever brought. People were afraid. But everyone knew the culprit. The Trust also used a system of rebates for retailers who agreed to buy only from the Trust.

In 1890, the Sherman Anti-Trust Act passed. So, the Distilling and Cattle Feeding Trust incorporated in Illinois as the Distilling and Cattle Feeding Company in 1890. Peoria then housed six of the twelve distilleries. By 1894 they made 80% of the nation's liquor. Most people drank more "Whiskey" than other alcohol. But whiskey today means something different. Back then it meant neutral spirit flavored with various flavorings. In the 1880s the average adult drank two-and-a-half gallons a year of "whiskey" (read neutral spirit).



James Veazy 1891. Congressman Julius C. Burrows, 1837-1915.

Distillers and Cattle Feeding cut out James Veazey, an expert at adding flavorings to rectified or neutral spirits. So, he told Congressman Burrows of Michigan and the House Judiciary Chairman. He persuaded the committee to watch him demonstrating the art! He actually bought a demi-john of neutral spirits with him into the hearing room and added water and various flavorings to show the process to the Judiciary Committee. All but one tried every single drink!

Veazey did this because he had contracted with a stockbroker called Allen and Company. They sold Distilling and Cattle Feeding (DCF) stock, which Veazey bought up. He knew this show to the Judiciary Committee would poison them against proper distillation practices like storing in charred barrels, etc. and increase DCF stock value.

But Allen and Co. stockbrokers only paid him \$6,000 of his profits and kept the rest for themselves. Veazey sued for his rightful share of the profits. But the courts saw him as an opportunist and his suits failed.

Incidentally Scottish whisky is called Scotch. Scottish people are not Scotch: they are Scottish! Whiskey is spelt with an "e" in America and Ireland, but without an "e" in Scotland.

In 1893 the State of Illinois sued the Trust as a monopoly. The court placed the trust into receivership. After two years only one group bid for it, shareholders of the old Distilling and Cattle Feeding Trust. They now had a new company called American Spirits Manufacturing Company (ASM). They paid \$9.8 million to buy 17 distilleries (of which six were in Peoria, and 2 in Beijing!) But ASM was less monopolistic. They lasted until prohibition in 1920 when the Illinois Attorney General closed them down. I could not locate any stock certificates of Distillers and Cattle Feeding, only of ASM.

Another of the Trust's successors were Distillers Securities Corporation, who in 1902 became the largest liquor producers in the US. They changed their name to US Food Products Company, then National Distillers. Interestingly, they continued distilling and storing whiskey throughout the prohibition from 1920 to 1933! After the Repeal of the Prohibition, sales were enormous! Later they diversified into chemicals and sold their liquor assets to Diageo and American Brands. The rest of the business became Millennium Chemicals, which now produces titanium dioxide, sunscreen and paint.

A footnote: All references I can find list the company that joined the Dow dozen in 1896 as the Distilling and Cattle Feeding Company (D&CF). This seems unlikely as the company was in receivership in 1893 and bought out by American Spirits Manufacturing (ASM) in 1895. One reference says it became ASM months after the DJIA 12 started on May 26<sup>th</sup>, 1896. It is possible that that the courts sold D&CF's assets in 1895 but transferred them in 1896. But I cannot see how Dow Jones & Co. would list a company in its Dow dozen that had been in receivership for three years and already sold to another company (ASM). Thus, they should list ASM as the original member of the 1896 Dow dozen not the Distilling and Cattle Feeding Company. Further, I could not locate any stock certificates of Distillers and Cattle Feeding, only of ASM. ASM only lasted three years in the Dow dozen.

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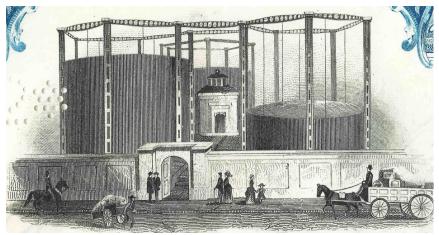
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#6. Laclede Gas Light Company. 22 \$100 shares of preferred stock to Johnson Kelley and Miller dated November 1892. Hole cancelled using round and star shaped holes. The punch out 22 at top is the number of shares not a cancellation. It was registered in Missouri, and also registered as a Trust Company in New York.

#1942



Vignette of Laclede Gas showing gasometers behind a fancy wall.

French fur traders Pierre Laclède and Auguste Chouteau explored the Mississippi River and founded St. Louis in 1764. They named St. Louis after the pious French King Louis IX (1226-1270). Pope Boniface VIII canonized the king (made him a saint) in 1297, hence St. Louis.





Pierre Laclède

King Louis IX of France

After recovering from a serious illness Louis IX vowed he would be religious. To say he was zealous is an understatement! After fighting in the 7<sup>th</sup> and 8<sup>th</sup> crusades, he died from dysentery during the 8<sup>th</sup> crusade in 1270. He ordered people's tongues and lips be mutilated for blasphemy and spend exorbitant taxes on supposed relics of Christ. He also ordered that all Jewish Talmuds be burnt. But he regularly had 100 poor peasants dine with him at his palace. The Pope canonized him posthumously for his piousness, and likely also for paying large sums toward the crusades.

People then had two alternatives to light their homes. First, candles; second, lamps using whale oil and kerosene ("paraffin" in UK). Persians knew of kerosene in the 800s. When in the 1700s Europeans heated coal to produce coal gas, liquids and coke, one of the liquids was kerosene. In 1846 Canadian geologist Gesner publicly demonstrated an improved process to make coal gas. In 1854 he got a New York patent for his improved process, which he sold.

The Missouri legislature passed a special Act in 1857 to found the Laclède Company to produce coal gas. The gas displaced candles and kerosene lamps. They appointed John P. Kaiser, a former steamboat captain, as president. The company reached the NYSE in 1889. It made the 1896 Dow dozen where it lasted for three years. Another gas company, Peoples Gas Light and Coke (formerly Chicago Gas Light and Coke) also made the Dow dozen.

After Edison introduced electric lights, Laclède (spelled Laclede in US) developed other uses for gas in 1906. Laclede and other gas companies realized that without gas lighting they needed to expand vertically i.e. using gas for cooking and heating. Philadelphia financiers controlled the company until 1912 when a St. Louis group bought controlling interests. Two Chicago firms then controlled it until 1937 when St. Louis businessmen regained control. In 1932 natural gas replaced coal gas, at which time they built a natural gas pipeline from Louisiana to St. Louis.

By 1950 they served 100,000 customers. Laclede had huge underground caverns to store the gas. In 1996 they changed their name to Laclede Energy Resources, and expanded into Iowa, Illinois, Arkansas and Louisiana.

In 2013 they became Laclede Energy Group expanding to Kansas, serving 1.1 million people. The next year they bought Alabama Gas Corp (Alagasco).

In 2016 they built a 60-mile pipeline to access shale formations in the northeast. They changed their name to Spire Inc. and bought Energy South.

Spire includes Laclede, Missouri Gas Energy, Alabama Gas Corp, and Energy South. They now have 30,000 miles of underground service lines, storage facilities, propane generators, odorization facilities, etc. serving two million customers in six states.

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#7. National Lead Company 100 shares of common stock, par value \$10, specimen certificate. Printed signatures but stamped SPECIMEN, numbered 00000, and hole cancelled. Undated, un-issued and incorporated in New Jersey. Printed by ABNCo.

The vignette shows a little boy with a bucket of paint and a paintbrush. Behind him are factories. A cogwheel lies on the ground representing mechanization, and a swan neck flask representing chemistry. #2373



National Lead Trust, a precursor to National Lead Company. Courtesy Max Hensley

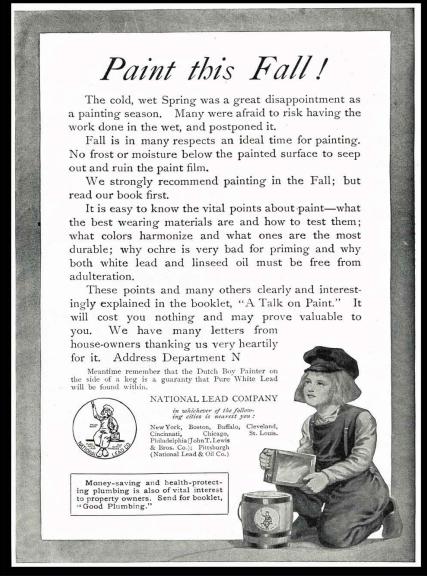
Dutch Boy Paints started in 1907, the same year Lawrence Carmichael Earle (1845-1921), an associate in the Academy of Design, created the painting on the right. The art rose to fame as an advertisement for white and red paint.

In 1887 the National Lead Trust grew out of various unsuccessful attempts to lessen competition by informal association. W.P. Thompson, former secretary of Standard Oil of Ohio became its president in 1889. In 1891 twenty-five leadmining and smelting companies consolidated into National Lead (NL). Bigger is better – it stymied competition. NL sprang to number one producer of bulk white and red lead oxides, for metal foundries and paints. Being the cheapest pigment, people had often used red ochre or ferric oxide paint on barns back to colonial times and on railroad structures. In 1896 National Lead became one of the Dow dozen where they stayed for 20 years.

By the 1920s businesses used lead in paint, solder, pipes, bearings, auto parts and other metals. NL's business dropped during the Great Depression. Unemployment climbed to 25% in 1933. But in the early 1920s NL had experimented with titanium dioxide as a pigment. They later used it in paint, paper, and dentures, becoming the largest titanium producer.

In 1941 NL found that titanium strengthened steel. The US government took over NL during the war to control this strategic asset. After the war NL partnered with Allegheny Ludlum steel to develop Titanium Metals Corporation of America. In the 1950s NL supplied 40% of US titanium. By then they had stopped mining lead and simply bought it from others.

In the 1960s NL diversified into oil drilling. They made titanium steel bits, and made specialized mud for oil drilling, competing with Schlumberger and Halliburton. By 1964 paints comprised 38% of their business, auto parts 23%, and metals 17%.



Old Dutch Boy figure advertisement used extensively by National Lead to advertise paint. Notice references to "health-protecting"

Until the 1960s, business schools taught that diversification led to more stable and profitable companies. But their thoughts on diversification turned skeptical in the 1970s, and downright critical in the 1980s. Not only that, it took business students 20 to 30 years to climb their corporate ladders. So, the skepticism of academics took another generation to percolate into the business world. This is why the illness of diversification and corporate acquisitions continued so long.

Starting in the 1960s NL became one of many companies that diversified too much, buying many other companies. This actually led to low, not high profits. In 1971 NL changed their name to National Lead Industries (NLI). The next year they reorganized into five divisions: chemicals, metals, industrial specialties, pigments, and fabricated products.

In 1973 even Ray C. Adam, the CEO, said they made too many things. "The only thing NLI does not make is money"! In 1974 he sold 38 of their 79 subsidiaries as well as their lead division. By then they realized lead was a liability because of its toxicity. He quipped that NL should stand for "no lead"!

NLI got into oilfield supplies and in 1976 bought Rucker Co., experts in the area. They had left Dutch Boy Paints as a separate entity, which they sold off, to Sherwin Williams in 1980. That year oilfield supplies comprised 50% of NLI income. But in the mid-1980s oil slumped and NLI lost value. Harold C. Simmons, a financier who developed the leveraged buyout, took over NLI. He divided it into Kronos for titanium products, and Rheox for solvents.

Meanwhile people began to realize how toxic lead really was. In 1909 France, Belgium and Austria were the first to ban lead paint indoors because of its toxicity. In 1922 the League of Nations banned white lead paint on interiors. The US opted out (I am sure you can guess why!) In the 1920s you could find lead in children's toys, paint on children's toys, paint on furniture and paint on houses. They even plumbed cities with lead pipes.

Lead poisoning is associated with poverty because low-cost homes often retain their lead piping and lead paints. Plus, abatement is expensive. The lead industry claimed lead created a healthy society. Remind you of the tobacco industry?

Lead is only toxic if you ingest it or inhale it. The word plumbing comes from the Latin word plumbum for lead. In ancient Rome they used lead pipes. A few historians have even claimed lead poisoning hastened fall of the Roman Empire. Most disagree. Lead pipes last 200 years whereas iron pipes last 20 years. Copper pipes last 50-70 years but are very expensive. By 1900, 80% of the US's largest cities had lead piping. Hot water leaches lead compounds into the drinking water, but cold water (unless it is acidic) does not. Cities now use ortho-phosphates to coat lead pipes to prevent lead leaking into the water. In Flint, Michigan, they blundered by not treating the water. It is now plagued by lead poisoning.

Young children, pregnant women and autistic children may develop picas (compulsive eating of non-food products). Eating lead paint is a pica. Until the 1950s Europeans used lead salts and mercury salts in teething powders for babies, something I occasionally encountered in family practice in UK in the 1970s. Lead acetate actually tastes sweet.

People can also inhale lead products in gasoline, sandpapered paint particles, and fumes from heated lead. In low concentrations it decreases children's IQ

and causes cognitive problems. Children are more susceptible to the effects of lead than adults, and the effect of lead is cumulative. High concentrations in children can cause abdominal pain, constipation, vomiting, anemia, neuropathy and convulsions. The current safe blood level is <5 mcg/dl. Levels above this require an investigation into its origin. Over 45 mcg/dl requires chelation therapy (intravenous chemicals) to remove the lead from the body.

In 1958 US Public Health organizations advocated people stop using lead paint indoors. Thirteen years later Congress passed the Lead-Based Paint Poisoning Act. In 1978 the Consumer Product Safety Commission banned all lead in homes, furniture, and toys. During the 1980s the US phased out gasoline lead additives. They outlawed new lead pipes in 1986. Imported pottery may contain lead-based glazes, which can dissolve from acids e.g. tomatoes or citrus fruits. Pipe fitters, auto repair, auto battery manufacturing (which today uses 75% of US lead) and stained glass window making may all lead to exposure. I only ever had one patient whose hobby was stained glass window making, but she never had problems!

In 2014 the Santa Clara County Superior Court ruled that NLI, Sherwin Williams and ConAgra were liable for a \$1.15 billion fund for lead paint abatement. The judge said they marketed lead paint, knowing of its toxicity and did not tell the public. After appeals NLI settled for only \$60 million.

One must respect the Public Health profession and we must look to them for their input on lead abatement. But the anti-lead movement can be prone to excesses. Lead from lead crystal, for example, does not leech into drinks and is safe. Lead oxide comprises 18-40% of lead crystal and increases cut glass's refractive index making it sparkle like a diamond.

The anti-lead movement has suggested another panacea - to remove exposed lead paint in all US houses. This would cost \$½ trillion or \$25,000 per house for 20 million homes. A further 37 million homes have intact lead paint, on which the taxpayer could spend even more unnecessary money.

What price a life? Well, to be fair, money does not grow on trees. Money for public health is limited. I once heard a quote that asbestos abatement in the New York City school system had cost \$1 billion per life saved. Public health officials commonly quote \$50,000 per quality adjusted life year (QALY) saved as reasonable. They use this to decide which programs to implement, though the Affordable Care Act currently prohibits this. But \$1 billion for one person unjustly robs thousands leaving no money to enhance other's lives.

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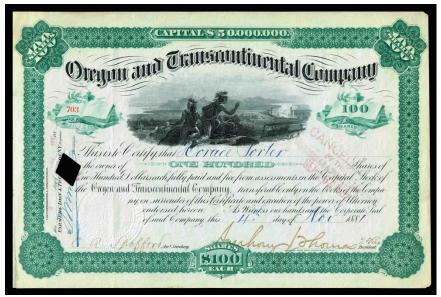


#8. North American Company 100 shares at par value of \$100 issued September 1890 to L.T. Hoyt. Issued in State of New Jersey, printed by Franklin Bank Note Company. Hole, stamp, and cut out cancelled. #1943.



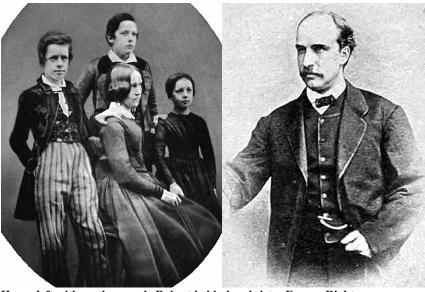
Vignette Eagle on an American shield with three arrows in its right claw, and lightning bolt on shield. Steam engine is a stock vignette.

Henry Villard started the North American Company (NAC) as a holding company in New Jersey to regroup the assets of the Oregon and Transcontinental Company (OTC). It became part of the Dow dozen in 1896. A year later a rope company replaced it.



Oregon & Transcontinental Company, Villard's northwest holding Company

Henry Villard (1835-1900) was born as Ferdinand Heinrich Hilgard in Bavaria. His father was a Supreme Court judge in Munich. At the age of 13 he sympathized with German revolutionaries. That year (1848) a series of revolutions spread through Europe, affecting France, German and Italian states, Austria, Hungary, Denmark, Wallachia and Poland. Because of his liberal political views his parents sent him to a semi-military academy in France.



Henry left with mother, uncle Robert behind and sister Emma. Right as young man

When he was 18, he emigrated to US without his parent's knowledge and changed his name to Henry Villard so they could not trace him. He became a journalist and financier. As the correspondent to the New York Herald in 1861 he supported Lincoln, the new Republican President (recall that Republicans had several Democratic values in those days and vice versa). After the Civil War (1861 - 1865) he became a pacifist and returned to Germany. There he wanted to get his countrymen to invest in the American West.

In 1866 Villard married Helen Garrison, a woman's suffrage advocate, and daughter of William Garrison, an abolitionist. Four years later he bought Thorwood, an estate in Dobb's Ferry, New York. It overlooked the Hudson River. Their fourth child, born there, died from a ruptured appendix. The remaining three children did not achieve much. But their granddaughter Dorothea taught at the American University in Cairo; their grandson Henry became head of economics at City College, New York; and their grandson Oswald became Professor of electrical engineering at Stamford.

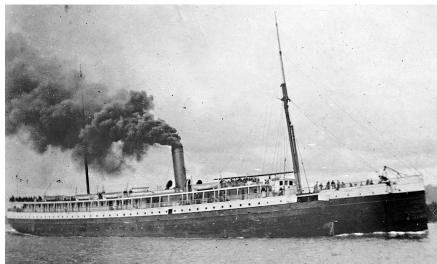
In 1874 Villard visited Oregon and decided he wanted to invest there. He represented many European investors, raising a lot of capital for western US railroads. The next year he became President of the Oregon Steamship Company and the Oregon and California Railroad. In 1879 he formed a syndicate, the Oregon and Transcontinental Company (OTC), raising \$8 million

to buy various northwest companies including the Northern Pacific Railroad (see original Dow Jones Transport 11). He became president of Northern Pacific from 1881 to 1884. In 1883 he publicized the northern trans-pacific railroad link with President Grant driving in the final gold spike. (Villard's son, Oswald, said the spike was not gold at all; it was just a "dirty old spike")! Villard traveled there in his private railroad car with his wife "Fanny" and his three sons and daughter, also with US Presidents Ulysses Grant and Chester Arthur. Owning a private railroad car then would equate to owning a private jet today.

The Northern Pacific Railroad opened emigration offices in Germany and Scandinavia. The offices looked for farmers to settle along the fertile Red River valley and in the northwest. Being German, Villard often traveled back to Germany to raise money from German investors. I discussed this on pages 48 to 51.

He incorporated OTC in Oregon as a holding company for the Northern Pacific Railroad and the Oregon Railroad and Navigation Company. His lines connected with the Union Pacific Railroad. In 1881 he bought the New York Evening Post.

As owner of the Oregon Railroad and Navigation Company he built the steamship SS Columbia, which housed Edison's first commercial electric lights on a boat.



SS Columbia a steamship operating 1880-1907 first commercial Edison lighting.

The Northern Pacific Railroad collapsed after Villard's overspending to complete a northern east-west rail route. He resigned as president in 1884. Some say he had a nervous breakdown. But he soon returned to Europe for more money to sell more stock to his European investors. In 1888 he again became director of the Northern Pacific. He died in 1900, but his wife "Fanny" lived on till 1928.

In 1920 the 19<sup>th</sup> Amendment (universal suffrage) passed. She could finally vote. The next year she led 2,000 women on a disarmament march down New York City's Fifth Avenue.

New Jersey passed legislation in 1889 to encourage trusts to convert to holding companies in New Jersey. OTC then incorporated in New Jersey as NAC in 1890. In 1896 it became one of the Dow dozen briefly. NAC became the holding company for many utilities including Laclede Gas. In 1928 NAC rejoined the DJIA 30 but only lasted for two years.

The SEC broke up NAC in 1946 because of the Public Utility Holding Company Act of 1935, which limited utility's operations to a single state or area. The Energy Policy Act of 2005 repealed this. What was left of NAC became the Wisconsin Electric Company, part of Wisconsin Energy, later WEC Group.



Villard Hall donated by Villard to University of Oregon at Eugene 1886.

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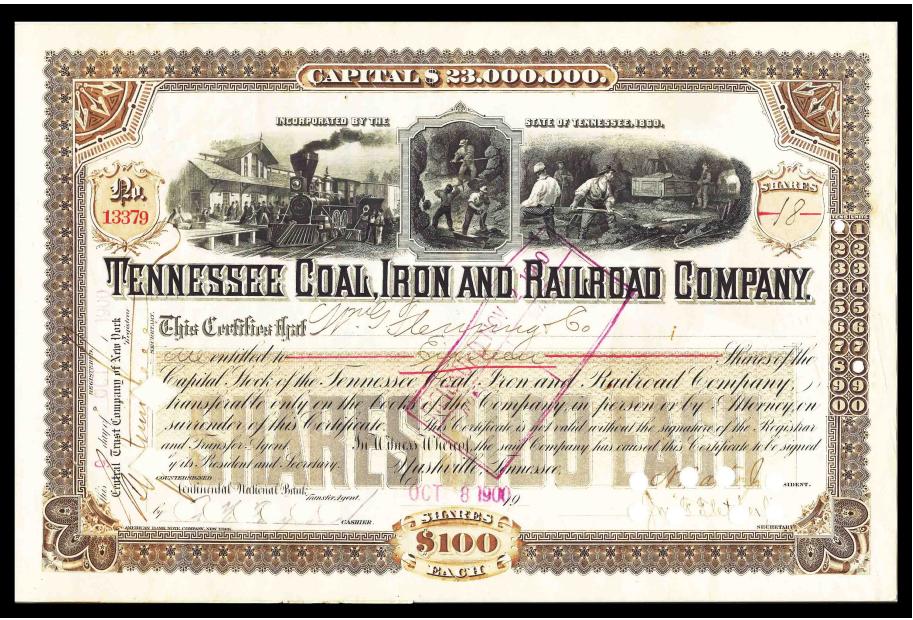
Sister Emma - Uncle Robert.jpg

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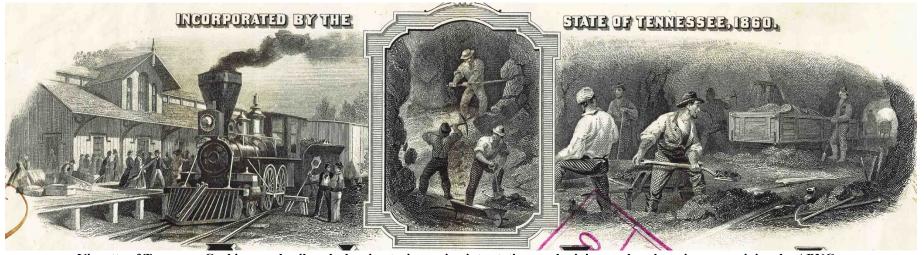
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https://en.wikipedia.org/wiki/Villard Houses#/media/File:Villard Exterior 118503pv.jpg



#9. Tennessee Coal Iron and Railroad Company, the precursor of US Steel. 18 shares of common stock to Fleming & Co. dated October 1900. Punch matrix in right margin. Hole cancelled with round and diamond shaped holes.

#1941.



Vignette of Tennessee Coal iron and railroad, showing train coming into station, coal mining, and perhaps iron ore mining, by ABNCo.

The Tennessee Coal Iron and Railroad Company (TCI) was also called the "Tennessee Company" and "Tencoal". It started as Sewanee Furnace Company in 1852 and became TCI. It integrated vertically early on as it had coal nearby and extensive railroad links, which helped their iron foundry business. It was one of the few industrial companies remaining in the south after the Civil War. In 1896 it joined the Dow dozen, but the real story comes later on with the formation of US Steel into which it was absorbed.



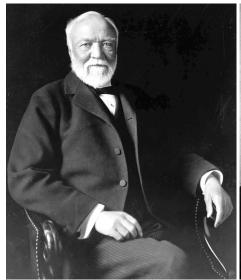
Tencoal furnace in Ensley, Alabama 1906.



Coking plant in Alabama bought by Tencoal.

In the late 1800s Tencoal relocated most of its business to Alabama, where there were coalmines. After the Panic of 1893 Tencoal shifted more to steel in the environs of Birmingham, Alabama, which had extensive, coal mines and competed with Pennsylvania steel companies. At one time Tencoal was the biggest steel company in US. In 1899 they had four 200-ton blast furnaces. By 1900 it had 17 blast furnaces, over 3,000 beehive coke ovens, 120 Solvay coke ovens, 15 mines and extensive railroad lines.

The main significance of Tencoal was that they were US Steel's chief competitors. US Steel bought them out in 1907. First, a brief diversion – the story of the formation of US Steel by J.P. Morgan from Carnegie's steel works.





**Andrew Carnegie** 

**Henry Frick** 

Andrew Carnegie (1835-1919) was born in Scotland to a weaver family who had lost out to industrialization. The family moved to Allegheny, PA in 1848 where Andrew got a job changing cotton spools at \$1.20 a week. The next year at the age of 14, he got a job as a telegraph messenger boy.



Modern photo of Carnegie Steel Mill at Etna, PA.

Andrew had a gift for Morse code, and in 1853 aged 18 he got a job paying \$4 a week as a telegrapher for the Pennsylvania Railroad Company. Six years later they made him superintendent of the Western division of the company paying

him \$30 a week. His boss, Thomas Scott, showed him how to play the stock market including insider dealing which was legal back then. Scott later became Assistant Secretary of War during the Civil War.

Five years later in 1864 aged 29 Carnegie invested \$40,000 in Storey Farm that became an amazingly successful steel factory. Andrew decided to build a steel factory for himself. Diplomatically, he named the mill after John Edgar Thomson, the Pennsylvania Railroad boss who had helped him.

Andrew was a mother's boy, eschewing marriage while she was still alive. When she died Andrew was 51. He soon married a Louise Whitfield, 21 years his junior. Even today, ultra-rich men marry women on average 22 years their junior.

Carnegie adapted the Bessemer process and used mass production and low wages to drive down prices. Sir Henry Bessemer, a British engineer, invented the process in 1856, revolutionizing the mass production of steel. Carnegie vertically integrated with suppliers, and in 1883 bought the rival Homestead Steel Works. Soon he produced 2,000 tons of steel a day.

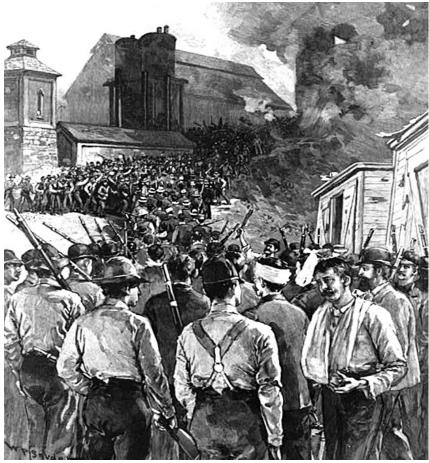
Two events marred his business career. The first was the Johnstown flood. Carnegie and 60 other gilded-age businessmen formed the exclusive club on a dammed-up lake. They called it the South Fork Fishing and Hunting Club. The club did not properly upkeep the unsafe dam, and members knew it. In 1889 the dam ruptured killing 2,209 people downstream in Johnstown. The club formed a relief committee to help victims. And as so often happens, the high-up muckety-mucks escaped prosecution.



Destruction three days after the flood in Johnstown 1889, 2,209 died.

The second black mark came in 1892 - the Homestead Plant strike. Carnegie left to vacation in Scotland and put the strike in the hands of his partner Henry Frick, who brought in 300 Pinkerton agents. Pinkerton started as a private detective agency and grew to include private guards. Big business often used them in the late 1800s to infiltrate unions. During the Homestead strike Pinkerton agents killed ten people and injured hundreds. The Pennsylvania

Governor brought in the state militia to end the strike. Frick then brought in non-Union strike breakers.



Homestead Riots 1892, ten died and hundreds were injured.

Enter master financier J.P. Morgan. In 1901 he merged steel companies in the US to form US Steel, the first US company capitalized at over \$1 billion. US Steel merged Carnegie Steel Co., Federal Steel Co. and National Steel Co. He paid Carnegie \$480 million for his steel works. Of this, Carnegie personally got \$225 million, paid for in 5% 50-year gold bonds. The interest alone was \$11.25 million a year. The Hudson Trust Company in Hoboken, NJ, built a special vault to house the bonds. I show one of his bonds on the next page.

Carnegie changed. Instead of the driven businessman, he became the driven benefactor. He spent \$350 million on charities till he died in 1919. He gave particularly to libraries, universities and educational institutions. Plus, a pension fund for former employees that grew into TIAA CREF. Carnegie also established the Carnegie hero fund to reward bravery.





Left: J.P. Morgan portrait. Right: threatening a reporter taking a picture of him. He had rhinophyma, a condition that causes a puckered, bulbous, wobbly nose. It embarrassed him no end.

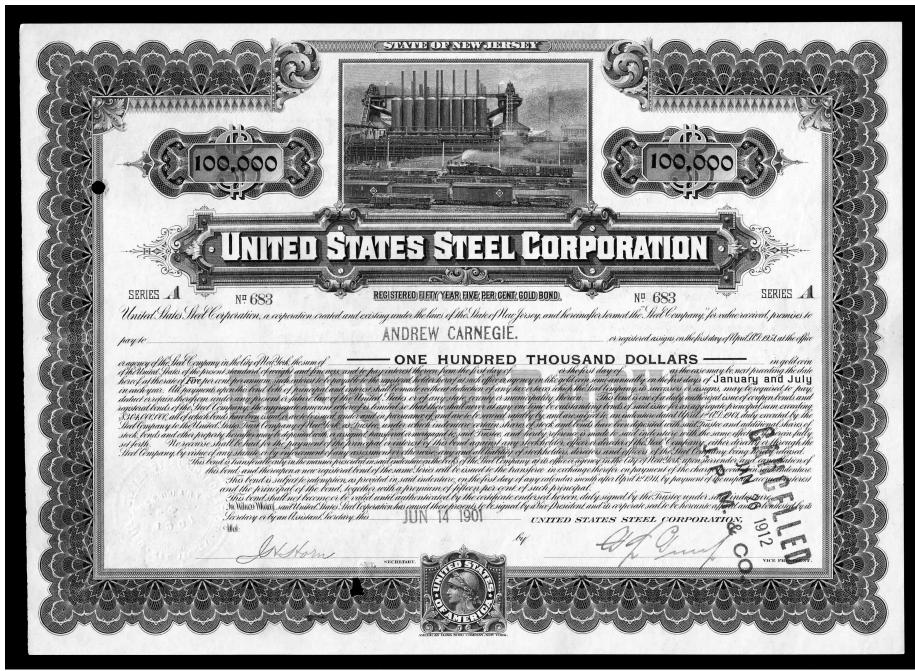
In 1907 J.P. Morgan suggested that US Steel buy the stock of the insolvent Wall Street brokerage Moore and Schley, who had lent money backed by 6 million Tencoal shares. Morgan was nervous about creating too much of a monopoly, so sent US Steel President E.H. Gary to Washington to request vetting from Teddy Roosevelt. Roosevelt agreed though later regretted it because of antimonopolistic sentiment. After US Steel acquired Tencoal, its largest US competitor, it replaced Tencoal in the DJIA where it stayed till 1991. In 1911 the government tried unsuccessfully to break up US Steel.

Tencoal used a lot of black prison labor. The year after US Steel took over Tencoal 60 prison workers died in accidents. In 1910 Tencoal developed a paternalistic non-prison labor system with "model villages" etc. They remained a profitable subsidiary of US Steel well beyond 1907. They opened new steelworks in 1917 called the Fairfield works in Corey, Alabama. Because Fairfield was so successful US Steel levied a tariff on it to reduce competition with US Steel's Pittsburg plant!

In 1901 US Steel controlled 65% of US steel production. But Bethlehem Steel innovated faster, and by 1911 US Steel only produced 50% of US steel.

In 1952 US Steel made Tencoal a division, and they lost their independence. This occurred just before US heavy industry started its decline. US Steel production peaked at 35 million tons a year in 1953. After the Second World Ward President Truman tried to take over the steel mills in 1952 to resolve a union crisis, but the Supreme Court blocked him.

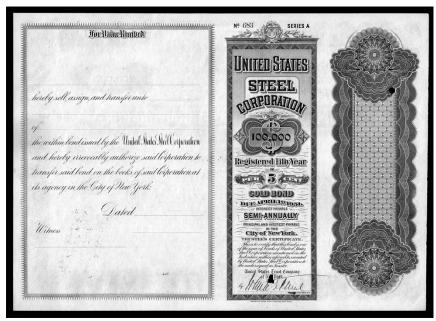
During the Reagan administration, Congress gave steel mills tax breaks to try to keep critical industries in the US. But the mills spent the money on acquiring other businesses instead. US Steel took over Marathon Oil in 1982, and renamed themselves USX Corporation in 1986, later becoming USS. In 1986 United Steelworkers of America went on strike. After six months of idle factories, this seriously degraded US Steel's market share. They had to close four plants hence the term "rust belt" for derelict factories. The Fairfield plant in Alabama made 3 million tons of steel in 2006. It closed in 2015.



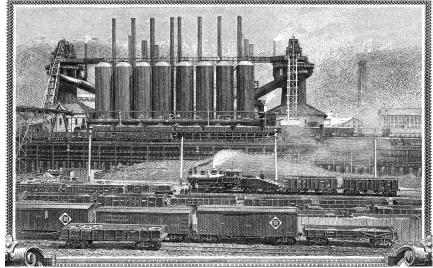
An original \$100,000 gold 5% 50-year bond J.P.Morgan used to pay Andrew Carnegie for his Carnegie steel mills in 1901.

Stamp and punch cancelled in 1912 by J.P. Morgan & Co. presumably for Carnegie to give to some charitable cause. Carnegie received 2,250 of these certificates i.e. \$225 million.

#2047.



Back of Carnegie \$100,000 US Steel Gold Bond



Vignette of US Steel Gold bond, entitled Railroad Cars and Storage Tanks.

William J. Brown, a prolific picture engraver who worked at ABNCo 1882-1920, engraved this vignette.

The Internet site, measuringworth.com, deals with calculating how rich various people were at various times. Many experts say that using CPI as a comparator is absurd. Likewise, experts feel that basing the comparator on the purchasing power of an average household or the earnings of skilled or unskilled workers



Example of a Carnegie Hero Medal.

does not make sense. Rather, they suggest using GDP per capita today divided by GDP per capita at time x as a comparator. Another comparator suggestion: simply divide GDP today by GDP at time x. Either way Carnegie comes out as one of the richest people of all time, up there with Cornelius and William Vanderbilt, John D. Rockefeller, Bill Gates, and Jeff Bezos.

US Steel was the first billion-dollar corporation in this country. It remained in the DJIA from 1901 to 1986. Their successor, USX, lived on in the DJIA 1987-1991. In 2014 it was even kicked out of the S&P 500, and now has a market capitalization of only \$4 billion, which places it in the lower end of a mid-cap company. China made 800 million tons of crude steel a year in 2015, Japan 105, India 90, and US 79.

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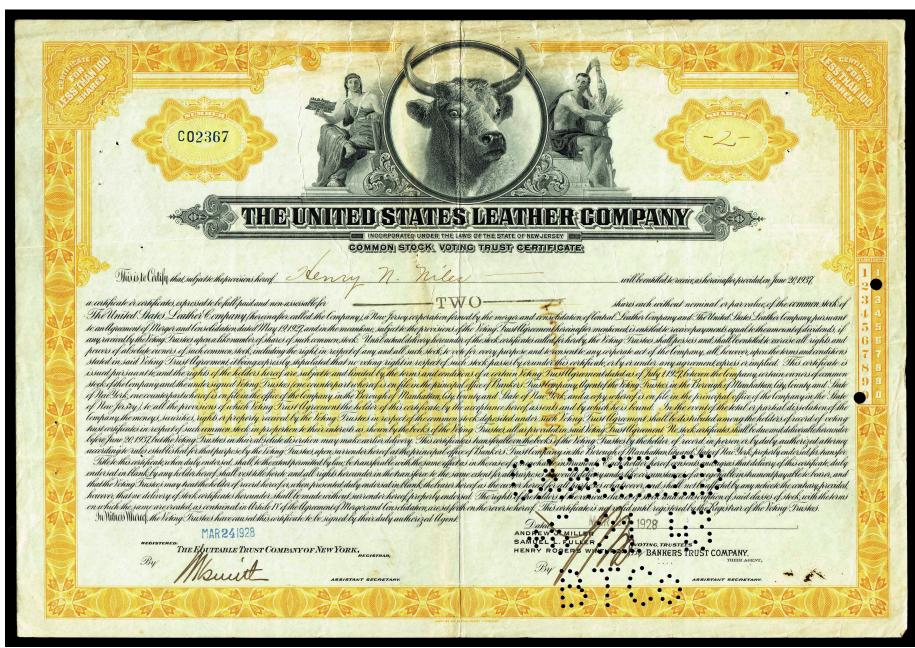
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#10. US Leather Company. Two shares of common stock to Henry Niles dated March 1928. Punch canceled 6.21.43 B T Co. #198



Vignette from US Leather Company. Lady with train and spade left (transport from forests to tannery), man with corn and scythe right (cultivating forest land). Steer head in center (for cow hide).

Why did US Leather Company make the Dow dozen? Answer: an over-optimistic stock offering in 1893, way above any other company of the era.

First, some background information: Hide refers to large animals, e.g. horses or cows. Skin usually refers to smaller animals, e.g. goats, calves or sheep. Hide or skin comprises three layers: the outer epidermis, the thick dermis (also called corium), and the subcutaneous fat. Leather makers (tanners) make leather from the dermis only. Tanners bought competitively from Argentina, Europe, Canada and the US. Most of the cost of creating leather was tannin, not labor. The industry did not really need capital. In fact, there was little point in merging unless they could create a monopoly or economies of scale. Indeed, over half the tanners refused to join, so there was no monopoly.

Tanners first dehydrated skins in the sun or with salt or pickling acids before transportation. This prevented the skin from going "off". At the tannery they soaked the skin in water to restore it, then soaked it in lime and water before machines removed the hair and fat. Next, they washed and de-limed the skin.

Then they soaked the skins in tannic acid (from tree barks and wood) to displace water from the hide's interstices. This cements the skin fibers together making the leather stronger. But it took weeks or months. One cord of hemlock supplied enough tannin for 40 hides. (In the 1930s tanners found chromium salts could do the same thing in days and make lighter colored leather). Next, they dyed and dried the leather.

In 1893 US Leather, under their first president, Thomas E. Proctor, issued stock for \$128 million for "hemlock sole-leather". Although people called them the "leather trust", they were not. Many sole-leather tanners had been operating at a loss. They decided to merge to imitate other 1890s basic goods industries that seemed to do well by merging. In 1893, 60 leather houses (with 110 tanneries) merged. They controlled 72% of hemlock tanning. Oak tanners did not join.

US Leather started with \$64 million of preferred stock and \$64 million of common stock, each with a share value of \$100. They promised a huge dividend of 8% on the preferred stock! Their capitalization was larger than Standard Oil Trust (capitalized at \$102 million when they were dissolved in 1911). American Sugar capitalized at \$75 million, National Lead at \$30 million, American Tobacco at \$35 million and US Rubber at \$50 million.

A cheap business had pumped up prices, despite having no monopoly or strategic advantage. The preferred stock's high capitalization accounted for their inclusion in the Dow dozen. People favored preferred stock back then. But they over-capitalized, and their stock values fell. During the first 11½ years, their Price-Earnings Ratio averaged 42, i.e. each \$100 share earned only \$2.38. Preferred stock remained in the Dow dozen for ten years. (The common stock never made the Dow dozen).

They failed because of several factors:

- Over-confidently predicting dividends and excessive capitalization.
- The Panic of 1893 (a recession that lasted till 1897) which interfered with business. The economy did not rebound afterwards either.
- Preferred stock only once reached the 8% they promised. The rest of their 11+ years in existence it averaged 5%. Preferred stock value dropped to \$75. Common stock value dropped to \$5 \$10.
- Non-US Leather tanneries competed just fine. US Leather had no monopoly and no economies of scale.
- It took 6 to 12 months from buying a hide to selling the leather. They had insufficient reserves to finance this holding period.

Given all of this US Leather reorganized. But nothing changed. They could not dig themselves out of their financial hole. So instead, after four years of negotiations, they merged in 1909 with the Central Leather Company.

In the 1910s Central Leather held their own but in the 1920s they lost it. Central Leather and US Leather Company both made only thick sole-leather. Demand for harness leather for horses fell as auto production rose. Factory belt drives also used sole leather. And unfortunately, just then, rubber belts also displaced industrial leather belting.

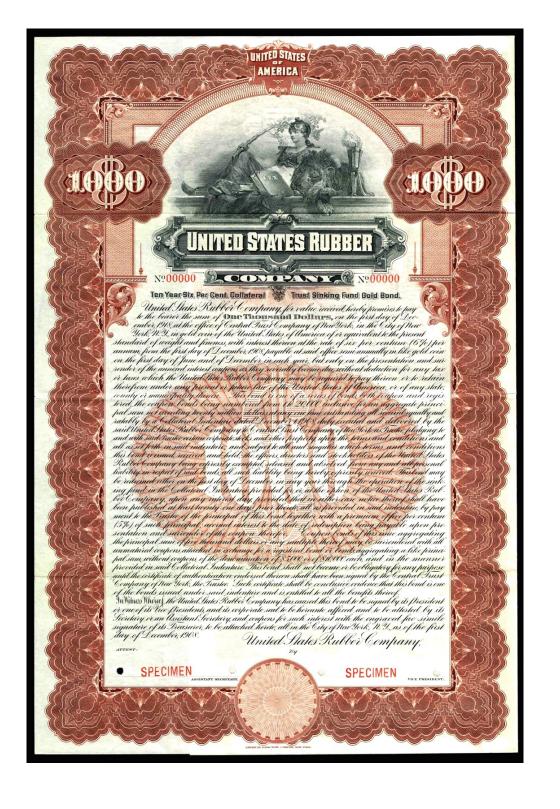
Central Leather had bought up land for hemlock forests to harvest their tannin. But recall chromium salts took over in the 1930s. So, they re-purposed their lands for coal, gas, hunting clubs and State land agencies. In 1927 they changed their name back to US Leather Company. In 1952 they liquidated, the only original Dow dozen company to do so (as of 2007). They quitclaimed the remaining assets to Keta Gas and Oil and stockholders received one share of Keta Gas and Oil per share of US Leather.

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# #11. Previous page US Rubber Specimen 10-year 6% Collateral Trust Sinking Fund Gold Bond for \$1,000. Unsigned, hole cancelled and stamped SPECIMEN. Serial # 00000. #1989



Helmeted lady with oak branch, book entitled LEX (law), lion & burning torch.

Natural rubber (also called India rubber or caoutchouc) is a naturally occurring isoprene polymer. Mesoamerican Olmecs used rubber from the Hevea braziliensis tree (called Para) for the ballgame po-ta-pok. The Mayans also used a rubber ball for a game called pitz. Aztecs used rubber to waterproof textiles.

In 1770, the chemist, Joseph Priestley described the ability of rubber to remove or rub off pencil marks leading to the name rubber.



Manaus at junction of Negro and Solimoes Rivers forming Amazon River

Brazil, especially Manaus, had many naturally occurring rubber trees, and they protected trade. During the late 1800s, Manaus became very wealthy from this, even building an opera house in the middle of the jungle. To export seeds was punishable by death. But in 1876 Englishman Henry Wickham, risking his life, smuggled 70,000 Para rubber tree seeds from Manaus to Kew Gardens in UK. Only 3% of the seeds germinated. But they sent them to all corners of the British Empire. They found Malaya worked best. After a generation, rubber plantations covered Malaya. The Belgian Congo and India also grew rubber.



Latex flowing from tapped rubber tree.

Rubber had many uses: tires, hoses, belts, gaskets, mounts, gloves, balloons, rubber bands, clothing, erasers and textiles. They found it difficult to stain textile rubber, so often covered it with other fibers. Natural rubber performed poorly in textiles. Synthetic rubbers like neoprene and spandex soon replaced rubber. As a child I visited a rubber plantation in Malaya. The two things I remember: the torrential rains, and the pervasive sickening smell.

Thailand, Malaysia and Indonesia produce 72% of all-natural rubber today. Rubber trees take seven years to mature, then for 25 years yield latex from V-shaped cuts in their bark. Workers gather latex, which they process to rubber.

In 1839 Charles Goodyear, while experimenting with rubber, accidentally contaminated some with sulfur on a stovetop. He found it improved elasticity and prolonged life making it useful for tires, conveyor belts, pump housing, etc. They called the process vulcanization after Vulcan, the Roman god of fire. The equivalent Greek god was Hephaestus, but "hephaestusization" would have been a mouthful!! Today producers make 8 million tons of natural rubber a year and 16 million tons of synthetic rubber a year from petrochemicals.





**Charles Ranlett Flint** 

**Charles Goodyear** 

Charles Ranlett Flint (1850-1934) started in the shipping business, trading rubber from Brazil to the US. Quite a formidable businessman, in 1892 he merged eleven rubber companies in Naugatuck, Connecticut, into US Rubber. One of these companies was Goodyear's India Rubber Glove Manufacturing Co., founded by Charles Goodyear, the discoverer of vulcanization. Flint later consolidated chewing gum makers forming the American Chicle Company in 1899. In 1911 he formed the Computing-Tabulating-Recording Company, later to become IBM.

Initially US Rubber controlled 50% of footwear sales. By 1898 it controlled 75% of US footwear companies. In 1896 it joined the Dow dozen where it stayed till 1928. By 1900 the rest of the rubber industry turned to tires, but US Rubber stayed with footwear. One of the tire companies, Rubber Goods Manufacturing Company, did so poorly that US Rubber bought it to get into the tire market. In 1906 Charles Flint arranged to buy the entire rubber output of the Belgian Congo to increase supply for tires.

In 1914, early in the First World War, Germany stopped supplying aniline, the main rubber accelerator and softener, so Naugatuck Chemical Company manufactured its own. US Rubber consolidated various brands and made Keds (canvas topped sneakers) in Naugatuck, CT. In 1917 they started making

rubberized fabric called "Naugahyde" which later used plastic instead of rubber, as it was fire resistant. It is no longer made in Naugatuck. US Rubber was the first company to commercialize latex. In 1918 US Rubber bought the idle ALCO (American Locomotive Company) building in Providence and retrofitted it to make solid and pneumatic tires.

In 1927 the Du Pont family took control of US Rubber. After the 1929 Wall Street Crash, tire sales dropped to 30%. So US Rubber lowered prices. During the depression average employment still averaged over 80%. Even at its nadir in 1933 employment was still 75%. US Rubber thrived, increasing market share from 7% in 1929 to 30% in 1931. During the Second World War they made primarily tires and boots. Then the Japanese blocked access to rubber in the Far East and the US developed synthetic rubber. As Sir Winston Churchill said, "necessity is the mother of invention".

One of US Rubber's subsidiaries was Uniroyal, which partnered with the Belgian company Englebert in 1958. Three years later US Rubber became Uniroyal. In the 1970s radial tires, which needed expensive new machinery, overwhelmed Uniroyal's finances. Continental AG then bought Uniroyal Company as a division in 1979. Seven years later Uniroyal merged with B.F. Goodrich as Uniroyal Goodrich Tire Company (UGTC). They did badly. In 1990 the French Company, Michelin Group, bought UGTC for \$1.5 billion.



Uniroyal giant tire in Allen Park, Michigan.

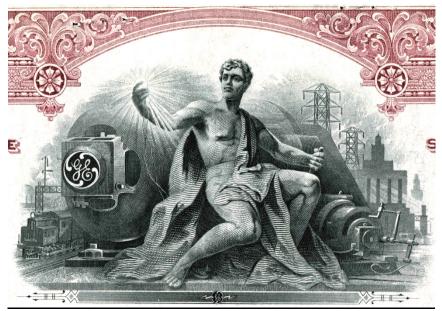
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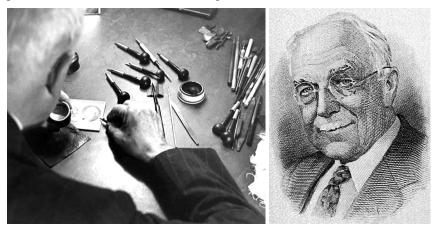


#12. General Electric 18 shares of common stock to Eve Duez, November 1937, note seal at bottom dated April 1892. Hole and punch cancelled 7+6.62 GE Co. Certificate printed by Republic Bank Note Company of Pittsburgh, PA. #2825



<u>Vignette showing allegory of electricity lighting a bulb in right hand, with</u> generators beside and factories, railroads and transmission pylons behind.

Elie Timothée Loizeaux (1873-1956) engraved this vignette entitled "electricity". He apprenticed at ABNCo aged 19 and studied at night at the Art Students League. Working for 53 years with ABNCo (1893-1946), he engraved stamps and banknotes for at least 29 countries. He also published horticultural works. His engraving tools were presented to the Smithsonian, who have a postal exhibit about him as a master engraver.



Smithsonian exhibit of Loizeaux Engraving of Loizeaux by John Hay

The late 1800s saw an industrial boom, which Mark Twain called the "Gilded Age" because it was glittering on the outside, and corrupt on the inside. In the late 1880s Thomas Edison (bankrolled by J.P. Morgan) battled his former

employee Nicola Tesla (bankrolled by Westinghouse) in the "War of the Currents". Edison thought DC was best. Tesla thought AC was best. The first electric lights adorned New York City in 1882, with their own generating station for DC when gas lamps still lit most homes. Tesla's AC eventually won.

Edison had several companies involved in electrical manufacturing, including motors, generators, lamps, sockets, etc. In 1889 Drexel, Morgan and Co. merged these companies into Edison General Electric Company. Three years later they merged with Edison Electric Company of Kansas, and Thomson-Houston Electric Company, to form General Electric. They incorporated in New York. You can see the date April 15<sup>th</sup>, 1892 on the seal on the stock certificate.



General Electric shops Schenectady, NY 1896.

In 1896 GE became one of the Dow dozen. GE distinguished itself with the longest reign in the DJIA. Walgreens/Boots finally booted them out in June 2018. In the early days of electricity there were only lamp sockets. If you wanted to use an electric iron, you had to have an adaptor to plug it into a lamp socket!

Initially appliances made people's lives easier with ovens, cookers, washing machines, toasters and irons, etc. Later other electrical devices entertained people. Today many people, especially millennials, look virtually hard-wired into their smartphones! But entertainment was not always that way.

The nobility, a tiny middle class and peasants comprised society in medieval times. When the subsistence existence eased off the middle classes grew, mainly in towns. They were the merchants and small manufacturers, who grew as cities grew. They even drove revolutions like the French Revolution in 1789. In times past, people entertained themselves in their home by reading, playing cards, collecting, playing musical instruments and dancing. The only polyphonic instruments (i.e. more than one note at once) in the 1700s were the

organ, the harpsichord, the harp and the lute. Ordinary folk could not afford the harpsichord and organ, and found it difficult to play the lute and harp. The guitar exploded in popularity from 1800 to 1850.

But in the 1850s piano production industrialized allowing ordinary folk to own pianos cheaply. Pianos then displaced guitars. People loved playing four-handed piano pieces, often orchestral works transcribed for two pianists on one piano. People also sang and danced with piano accompaniment. Courtship involving closeness and touching finally became possible and respectable in Victorian times. Imagine!

Thomas Edison invented the phonograph in 1877. It took until the 1890s for them to become widespread. Edison originally envisaged their use only as dictating machines. But others developed phonographs enabling people to listen to music performed by masters in their own home. From 1895 to 1920s was the era of the phonograph. You could hear a full orchestra in your own living room. Hundreds of singers could make recordings. But who wanted any of them if they could hear Enrico Caruso himself on disc? Recording companies jumped at the chance to use the top recording artists in their fields, who became wealthy. Victor Talking Machine Company emerged as the pre-eminent phonograph maker. Later, GE's radios and combination radio/phonographs displaced them.

In the late 1920s radio became the primary source of entertainment for families. They would sit around the radio listening to music, news, advertising, politics, radio plays and other engaging programming. GE dominated radio manufacturing. Interestingly, the Nixon/JFK debating season in 1960 marked the first public changeover from radio to TV in politics. People listening to radios proclaimed Nixon the winner. People watching TVs proclaimed JFK the winner - a fascinating commentary on the importance of non-verbal communication. They made only black-and-white TV till the 1960s then gradually converted to color. GE dominated TV manufacturing as well.

You could watch old movies on TV, but the advent of the VHS player in the US in 1977 allowed people to watch movies in their own home. This increased in popularity in the 1980s. In 2003 DVD rentals exceeded VHS rentals for the first time. Blockbuster video rental stores sprang up everywhere. Netflix at first mailed DVDs to people then provided online movie downloads, and by 2010 Blockbuster went bankrupt.

In the 1990s home computers mushroomed into another form of home entertainment. The first smartphone appeared in 2000 though it was "clunky". The iPhone, first appearing in 2007 matured as the first practical smartphone to grab people's attention especially with social apps, news, music streaming, etc.

GE participated in many but not all of these advances. Of course, each form of entertainment did not stop when the next one appeared. People may use computers today. But they still play guitar and piano, listen to radio, watch TV, listen to music, and watch movies at home.

GE founded Radio Corporation of America (RCA) in 1919 after buying Marconi Wireless Telegraph Company of America. Today we think it quaint to call it "wireless telegraph", but that was how the word "wireless" started. (No doubt people will find it quaint in 30 years' time that we use the word wi-fi!) In 1926 RCA started NBC, which built two broadcasting networks for radio, and later for TV. In 1927 GE first broadcast black-and-white TV experimentally on a 1.5 square inch screen! Then they manufactured radios, TV sets, record players and computers. But they missed the home computer revolution.



RCA first broadcasting studio in Roselle Park, NJ, 1922.



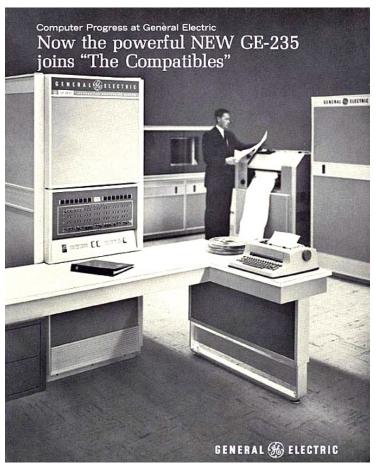
**GE Junior S-22 Console Radio 1931** 



GE HM-185 Early Television set 1939.

GE started manufacturing superchargers during the First World War for airplane engines. These were air compressors pushing more air into the cylinders of internal combustion engines to increase efficiency. When they developed jet engines in the 1940s, GE Aviation became huge.

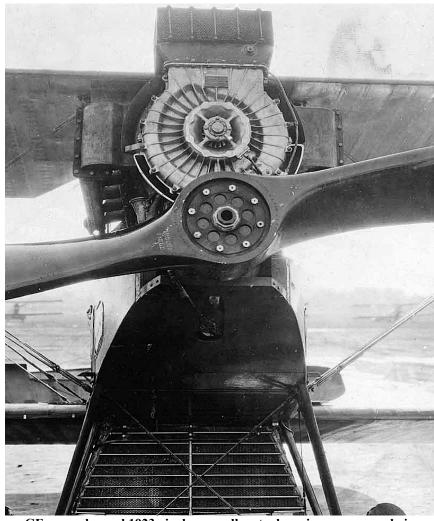
In the 1960s IBM, NCR and Honeywell made mainframe computers for businesses. GE got into the act as well and developed their own operating system. They partnered in research with Bell labs then MIT. Except for the federal government, GE was the largest user of computers in the 1950s and 1960s. In 1970 GE sold their computer division to Honeywell.



<u>GE-235 mainframe computer 1964.</u> Note the interfaces – a printer and a typewriter, no screen!

Jack Welch ran GE from 1981 to 2001. From the 1980s on, GE bought and sold many businesses including NBC, Kidder Peabody Securities, software, wind energy, Universal Pictures, financial companies, aerospace, oil and gas, Comcast, banks, CT scans, gas engines, Citigroup credit cards, oil field supplies, property, water treatment, plastics, petrochemicals and locomotives. You might ask: What didn't they get into! With such diversification they seemed to have no core competency.

While run by Jack Welch, GE was a goliath conglomerate probably the most successful conglomerate in world history. Welch obsessed about setting targets and keeping them. He disdained GE bureaucracy and early on eliminated 100,000 jobs. He insisted that managers fire the bottom 10% of performers, a procedure that people called "rank and yank"! One of his maxims was "fix it, close it, or sell it". GE even ran a campus for management studies complete with a large theater and dorms, visited by many aspiring managers outside GE.



GE supercharged 1923 airplane, really a turbo using compressed air.

In August 2000 GE's capitalization was \$600 billion with 300,000 employees, and a pension plan covering almost 500,000 people! I studied GE's financial statements when doing financial accounting for an MBA in the 1990s and was astounded to see their pension plan was in the hundreds of billions! GE had several divisions including GE Capital, its finance arm like a bank that powered their multiple businesses. When Welch retired in 2001 GE was riding high. That year the World Trade Center bombing hit and GE's insurance and airline products tanked. Jeffrey Immelt replaced Welch as CEO – navigating a turbulent era until 2017. GE had started as a company making electric machines and appliances. Where had their core competence gone? One website described their core competence as "selecting the best management practices and adapting and evolving these practices". Sounds like management-speak!

Immelt, a jocund political master, bought Alstom for \$17 billion. He bought it against all advice. He suffered from the acquisition sickness taught in business schools in the 1950s and 1960s. But Immelt went to college in the late 70s, by which time acquisition sickness was eschewed by most business schools. Perhaps he was parroting the maestro Jack Welch who went to college in the 1950s and had a severe case of acquisition sickness. Alstom was a French train, rail, turbine and generator manufacturer. Immelt chose, as did so many failing companies, to buy other companies rather than refocus on GE's core competency. But GE's history of managerial mastery made the company seem impregnable. Immelt genuinely thought GE's magic could revive an old French railroad company. But France demanded more concessions, and Alstom blocked GE's access to their order book (which had been making lowball offers to keep business)!

GE Capital, previously a conservative finance arm helping customers buy products, over-leveraged themselves. They got into financial services just before the 2007 to 2009 banking crisis. Their stock fell from \$41 to \$9 from 2007 to 2009. In 2014 they also invested in oil and gas just before the oil price dropped from \$150 a barrel to \$40 a barrel. The next year 2015 GE wanted to detach itself from Federal reserve requirements, so they sold \$216 billion of real estate, rail cars and mortgages, losing an enormous market. GE thought they could then buy back GE shares and offset the earnings loss of GE Capital.

At a 2017 meeting GE's Power unit predicted 5% growth, though cognoscenti knew it would be below 4%, despite creative accounting. Immelt appeared shaky at the meeting. He knew the unit was losing money. Question: did Jeff Immelt sink GE, or was he just the captain of a sinking ship? GE stock again fell from \$30 in 2016 to \$8 in 2019. GE's market capitalization fell from \$600 billion in 2000 to \$105 billion January 2020.

Welch later nastily divulged he gave himself an A for performance and gave himself an F for choosing his successor (Immelt)!

GE's future seems to be in healthcare devices, aerospace, renewable energy and research. Apple recently became the first public company worth \$1 trillion. In the past GE had been close. Amazon briefly reached \$1 trillion in September 2018. Other modern-day companies that have strived for the \$1 trillion capitalization mark are Microsoft, Alphabet and Berkshire Hathaway. Technically, the first \$1 trillion company was PetroChina. But it is not a private company. It is state-owned.

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## **CHAPTER FIVE**

# The Second Dow Jones Industrial Average: 20 stocks in 1916

The twenty companies of the new DJIA 20 in 1916 were:

- 1. American Beet Sugar
- 2. American Can
- 3. American Car and Foundry
- 4. American Locomotive
- 5. American Smelting
- 6. American Sugar later Domino dealt with in last chapter
- 7. A T & T (American Telephone and Telegraph)
- 8. Anaconda Copper
- 9. Baldwin Locomotive
- 10. Central Leather
- 11. Goodrich
- 12. Republic Iron and Steel
- 13. Studebaker
- 14. Texas Company
- 15. US Rubber dealt with in the last chapter
- 16. Tennessee Coal Iron and Railroad Company later US Steel dealt with in the last chapter
- 17. North American Company dealt with in last chapter
- 18. Utah Copper
- 19. Westinghouse
- 20. Western Union dealt with in last chapter.

Thus, although there were 20 companies in the new DJIA 20, only 15 were new, five had already been in the original 1896 Dow dozen.

## #1. American Beet Sugar.



Vignette of American Beet Sugar: an eagle with capitol building and town behind.

I always used to think sugar came only from sugar cane! But it also comes from sugar beet. Sugar beets are 75% water, 20% sugar and 5% pulp. They grow exclusively in temperate zones. By contrast sugar cane grows exclusively in tropical and sub-tropical zones. Although the leaves are perfectly good as salad

greens sugar beet growers have never bothered marketing them, possibly because it would need changes to their expensive harvesting machinery. They reprocess the pulp remaining after sugar extraction as animal feed.

In 1747 Andreas Marggraf, a Berlin Professor of Physics, isolated sugar from beetroot and showed the sugar (sucrose) was identical to cane sugar. The sugar yield was 1.3 - 1.6%. His student, Franz Achard, found a strain of mangel-wurzel called Silesian sugar beet with 6% sugar.

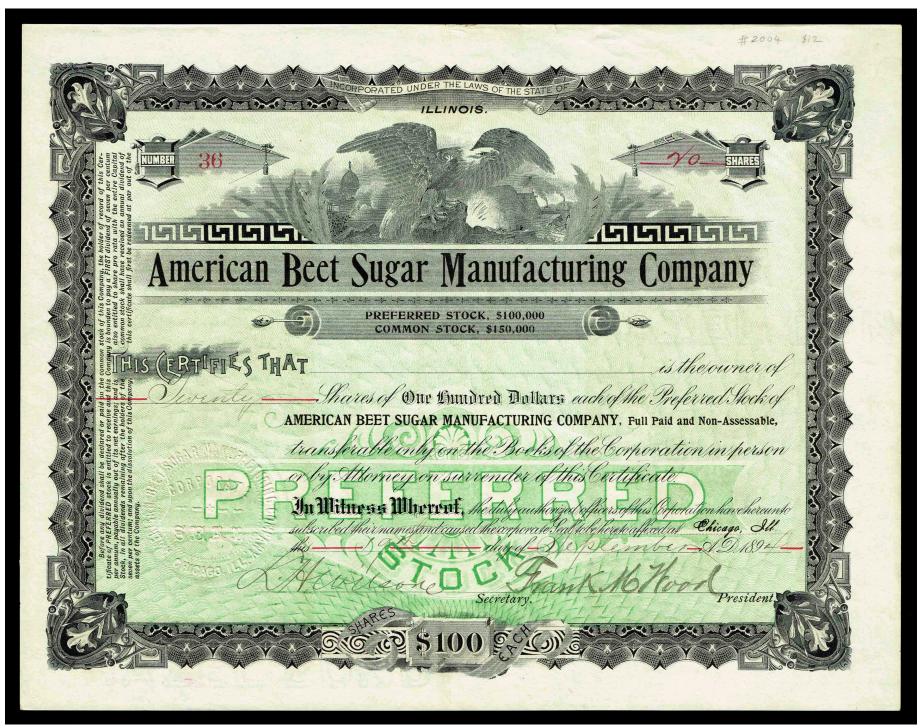
Under the auspices of Prussian King Frederick William III, Achard opened the first sugar beet factory in Kunern, Silesia (now Poland) in 1801. Before then sugar only came from sugar cane and was expensive. Prussia taxed the sugar beet crop rather than the sugar. This pushed scientists to develop varieties with more sugar. Napoleon ordered sugar beets be studied and planted in 1811 as the British were blockading cane sugar imports during the Napoleonic wars (1803-1815).

By 1837 France produced more sugar beet than any other country. But Germany had superior processing factories and by 1880 processed much of the French crop. By 1840 5% of world sugar came from sugar beets. By 1880 50% came from sugar beets. Starting in the 1850s Russia and Ukraine subsidized their own sugar beet crop, which harmed cane sugar exporters.

Farmers introduced sugar beet into the US in 1830. Abolitionists founded the "Beet Sugar Society of Philadelphia" in 1836 to produce "free sugar" (i.e. not made by slaves). They wanted to decrease support for the Caribbean slave based cane sugar. Ebenezer Dyer built a beet factory in 1870 in Alvarado, CA (now Union City), but it depended on subsidies, and made no profit until 1879.



Sugar beet factories seen mainly north US, cane sugar refineries in south.



#1. American Beet Sugar. 20 shares of \$100 preferred stock, unissued, September 1894. Uncancelled.

Dyer's success caused the Church of Latter-Day Saints to back the Utah-Idaho Sugar Company. Sugar beet spread to California, Nebraska, Utah, Montana and North Dakota. It was often the Japanese who worked the fields and they developed an expertise in its care. The First World War caused a shortage of sugar in England. They developed their own subsidized sugar beet industry by the 1920s. After the Second World War US sugar beet growers hired many Japanese internment camp workers because of their expertise with sugar beet.





Sugar beet in ground. Sugar beet out of ground held by my wife, Ann Jones

Sugar beets are finicky growers. They need sandy loams; temperatures of  $60^{\circ}$  –  $70^{\circ}$  F; little wind and lots of rain; deep plowing; crop rotation typically with peas, beans or grain for two of three years; and well-controlled weeds. Think: labor intensive in times past, and mechanization now.



Old one row harvester at Red River Valley Sugar beet museum.



Old one row harvester at Red River Valley Sugar Beet museum.



New multi-row harvester at Red River Valley Sugar Beet Museum.

When sugar beets arrive at the factory, they slice them and pass them through a counter-current hot water diffuser for  $1\frac{1}{2}$  hours. This dissolves the sugar in water. They then press the pulp to release more sugar. Next they treat the juice with calcium hydroxide suspension to remove other substances and then carbonate it to precipitate the calcium carbonate. Next they evaporate the remaining "thin juice" to "thick juice" of about 60% sugar. After concentrating it further by boiling they seed it with sugar crystals. In the early 1800s "free sugar" tasted terrible until factories figured out how to remove awful tasting chemicals.



Sugar Beet Processing Factory in Red River Valley.

In 1889 Henry Koenig of Grand Island, Nebraska promoted sugar beet with up to 18% sugar. Henry Oxnard had traveled to Europe to learn about the beet sugar industry, after his father, Thomas, operated cane sugar refineries in other states. Henry established the Oxnard Beet Sugar Company, which built the first sustained successful sugar beet processing factory in Grand Island, Nebraska in 1889 to 1890. He then built the Norfolk Beet Sugar Company in Norfolk, Nebraska and the Chino Valley Beet Sugar Company in Chino, California. He organized the Oxnard Construction Company in 1894, and presumably issued the preferred stock (see page 118) to build sugar beet factories the same year.

According to the History of American Crystal Sugar Company, after Henry's success in 1890 he combined the Grand Island, NE; Norfolk, NE; Chino, CA; and Ventura County, CA factories (now called Oxnard) to form American Sugar Beet Company (ASB) in 1899. However, the stock certificate is dated 1894, suggesting it started then. In 1900 they opened a factory in Colorado.

In 1918 the Minnesota Sugar Company opened factories for the Red River Valley, which ASB bought in 1924. Five years later they bought the Amalgamated Sugar Company of Utah, Idaho and Montana. In 1934 ASB changed their name to American Crystal Sugar Company (ACSCo) and opened more plants.

In 1972 Red River Valley growers bought out ACSCo as a grower's cooperative. Two years later the federal sugar program ended. It had provided a market for 40 years. In 1977 ACSCo built an \$8 million research center in Moorhead MN.

In 1993 ACSCo with other companies formed the United Sugars Corporation to market sugar. Five years later ACSCo planted 500,000 acres. In 2003 they built a \$100 million facility to extract sugar from sugar beet molasses (before used only for cattle feed). In 2008 they started a sugar to ethanol program for excess stocks of sugar.

The sugar beet industry provided 142,000 jobs in 2020, contributing \$20 billion a year to the US economy. Farmers own 100% of sugar beet companies. The US no longer subsidizes sugar, but the rest of the world still subsidizes it.

The US makes five million tons of sugar from beet, four million tons from cane, and imports three million tons a year (2018 projected figures). Researchers continually try to raise beet sugar content over the current 18% and try to make them more resistant to climate changes and disease. Two thirds of sugar in the world still comes from sugar cane, and one third from sugar beet. But, in the US 55% of sugar comes from sugar beet.



Red River Valley drainage basin. Red River is highlighted.

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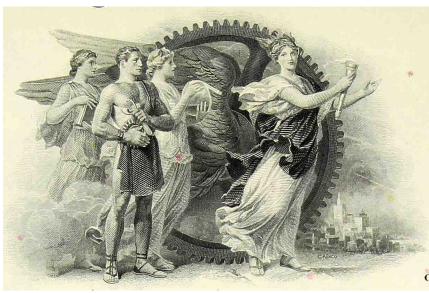
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#2. American Can Company. Specimen stock certificate for 100 shares of common stock. Serial # 00000, stamped SPECIMEN over signatures, hole cancelled. Registered in New Jersey 1903 on seal. #1994



Vignette of American Can Co.

The vignette shows a lady with a torch leading to the right. Three people follow her; one carries a retort; one carries a book; and one carries a hammer, cogwheel and calipers. Behind them is a giant cogwheel with wings, to represent mechanical speed. It looks to me as though this was a stock vignette of ABNCo but it could have been an allusion to canning.



In 1795, to help him feed his army, Napoleon offered a prize to the inventor of a method to preserve food. Nicolas Appert boiled airtight glass jars containing food, inventing the preservation process. Napoleon gave him 12,000 francs if he would publish his methods, which he did in 1810. Months later, Philippe de Girard, a Frenchman, invented the can using the same process. He told Peter Durand, an English merchant, about it. Durand obtained a British patent for it. When Girard journeyed back to London to object to the theft of his invention, he got nowhere as the Napoleonic wars (1803-1815) were in progress.

Durand sold the patent to Bryan Donkin for £1,000. Donkin owned English papermaking factories and was already a successful manufacturer. He made his early cans of wrought iron up to 4 mm thick. They contained 4 to 20 lbs. of food for military use, and in 1813 the Admiralty (British Navy) started buying from him. They had to open these cans with a hammer and chisel!

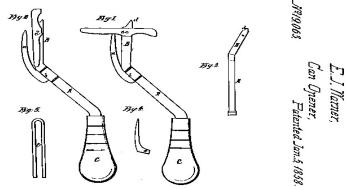
Donkin then partnered with John Gamble. More interested in the engineering challenges than in money, Donkin left the partnership in 1821 and helped Brunel build a tunnel under the River Thames. Brunel was the famous engineer who built the *Great Eastern*, then the largest ship in the world. Donkin had a brilliant mind and became a Fellow of the Royal Society. He died in 1855.

John Gamble moved his canning business to Cork, Ireland where there were more cattle to make beef and a shorter shipping route to the US. A competitor, Stephan Goldner, undercut all other canners' businesses. But he did not cook his meat enough and sometimes substituted a cheaper meat for the labeled meat. This led to a scandal in 1853 when authorities found many bad cans of food and they banned him from canning. Canning went out of favor in UK briefly till canned condensed milk helped the milk supply problem in large cities. Rural milk was close to the supply. But, to transport milk from the country into large cities and distribute it often took so long the milk went sour. Louis Pasteur invented milk pasteurization in 1864, but it only started commercially in the 1882.

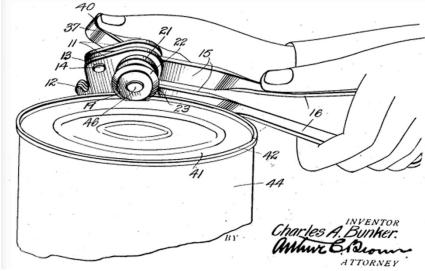
In 1845 the Arctic Expedition under Sir John Franklin tried to locate the last section of the famed Northwest Passage. Two unusually cold winters entrapped them. Everyone perished. Later researchers found crewmembers' organ lead contents were high, but recent research has suggested the ship's plumbing, not the cans, caused this. In the 1840s they were still soldering the cast iron cans with a lead based solder. Nowadays crimping technology creates the airtight seal instead. The English still use the word "tin", not "can".

In 1825 in the US, Thomas Kensett and Ezra Daggett patented tin plate for cans. Cans came to be made of thin steel, coated with tin. Interestingly people still had to open these cans with a knife until Ezra Warner invented a can opener for the new thinner steel cans in 1858. I recall my parents having a similar device using a hinged sturdy blade to open the can.

The American Civil War (1861 - 1865) kick-started the US canning business. Canneries opened wherever the foods were: oysters, salmon, corn, carrots, beef, etc. They opened all over the world especially in the US.



Ezra Warner's patent for can opener 1858.



Charles Bunkers patent for the serrated wheel can opener 1925.

Charles Bunker invented the serrated wheel can opener in 1925 making it even easier to open a can. Modern cans of thin steel are usually three pieces (tube, top and bottom), aluminum cans are usually two-piece (cup-like bottom and top). Tin can is corroded by acidic foods like tomatoes, citrus fruits and rhubarb, so they use other coatings called lacquers rather than tin on the steel cans.

A group of entrepreneurs who recognized the increasing utility of cans incorporated the American Can Company (ACC) in 1901. They saw their use for paint, tobacco, foods, gasoline, oils, tea, shoe polish, etc. ACC incorporated in New Jersey in 1903. They were originally one of the "Tin Can Trust". But by 1901 they were making 90% of US cans. They used the latest technology that blew their competitors out of the water. In 1916 they became one of the new DJIA 20 lasting until 1927 then rejoining the DJIA from 1959 to 1988.



American Can Building, Cincinnati, during renovations to apartments.

ACC had many inventions: the double crimping techniques to eliminate soldering on the top and bottom; enamel linings; the double tight friction cover for paint cans; vacuum packed coffee; and lacquered tops. In 1921 they built a new type of factory out of reinforced concrete in Cincinnati, OH. This used long spans, more open spaces, more ventilation and more outside light. This enabled large industrial machinery on the factory floors. All of these innovations improved production. At the time others built factories of wood. This limited spans, machinery size, floor loads, ventilation, light, etc.

ACC used the building to manufacture can-making machines, not to make the cans themselves. Measuring 180,000 square feet in five stories in Cincinnati, Ohio it has now been converted to apartments called American Can Lofts.

In 1985 Triangle Industries bought National Can, and the next year ACC. In 1987 Triangle Industries changed their name to American National Can (ANC). One year later Pechiney S.A., a French state-owned metal conglomerate, bought out ANC. ANC then went private and then had an IPO for \$500 million in 1999. In 2000 Rexam, a British consumer packaging company bought ANC for \$2.1 billion. In 2016 Ball Corporation bought Rexam. Ball was founded in Buffalo, NY in 1880 as the Wooden Jacket Can Company. They had invented the first semi-automatic glass-making machine in 1897 and specialized in home canning. In 1996 they exited the glass business and went into metal cans instead. As with so many companies since 1980s financial finagling meant constant turnover!

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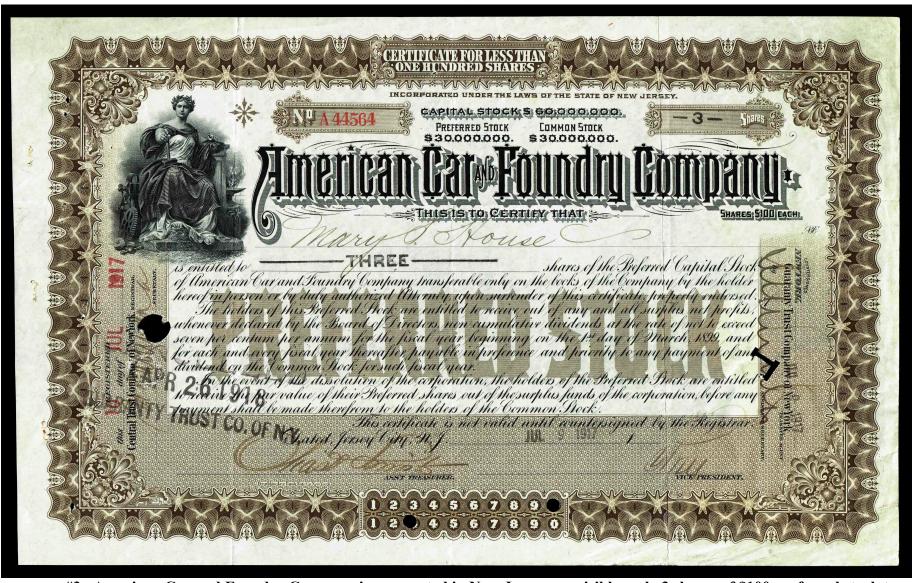
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#3. American Car and Foundry Company incorporated in New Jersey, no visible seal. 3 shares of \$100 preferred stock to Mary House dated July 1917. Hand-signed by company officers. Note number matrix at base. Stamp cancelled 1918, as well as punch cancelled by L shaped and indented circle punches. Note two staple rust marks on left margin.

#1977



Vignette of American Car and Foundry Company Stock Certificate 1917.

This fine vignette shows a seated, laureate allegory of mechanics. Her attributes include a hammer, spike, cogwheel, vice, wheel, nuts, anvil and pliers. The little-known Franklin-Lee Bank Note Company of New York printed this.

With US rail's vast network and an expanding economy, one of the things America still needed was railroad cars, especially for specialty transport. First a brief diversion on the most famous railroad car company, the Pullman Coach Company who became an institution. They invented folding sleeping berths in luxury passenger cars with washrooms for men and washrooms for women in each car. Not only that, Pullman operated it as a full service. They hired porters who travelled on the trains with the passengers. The porters made and pulled down the beds, carried baggage and provided services (room service from the dining car, shining shoes, valet, sending and receiving telegrams). At its peak in 1929 Pullman slept 150,000 passengers every night using 15,000 porters. The porters, almost all African American, enjoyed one of their few lucrative positions of the era.



<u>Pullman Stock Certificate of 52 shares to Marshal Field (of Chicago</u> department store fame), November 1881. Punch and hole cancelled.



Vignette showing St. Pancras Station London, and Pullman Works in Detroit.



Pullman Car 1910-20. Bunks pulled down from above and sofas converted.



Private Pullman Car.

Pullman built their first car in 1859. George Pullman established his company in 1862 in a Chicago suburb now called Pullman where he built a model town for his employees. Cars had patented "paper" car wheels. They insulated the wheels from the hub with compressed paper, which significantly quieted the ride. Pullman had a bitter strike in 1894 during the Panic of 1893 (i.e. the recession of 1893 to 1897).

Pullman also made private railway cars – today's equivalent of corporate jets. After Pullman died in 1897, Lincoln's son, Robert Todd Lincoln, took over as Company President. After the Second World War (1939 to 1945) automobiles and plane travel displaced Pullman's service. Pullman folded in 1968.

But many other railroad car companies made cars, not just Pullman with their luxury passenger sleeper cars. Thirteen smaller railroad car manufacturers merged to found the American Car and Foundry Company (ACF) in 1899. The word car did not mean automobile. Autos hardly existed then! Between them these 13 companies made 53% of all railroad cars in 1898. The companies started up between 1864 and 1892. Two were from Missouri, the rest were from Union states in the north.

Within three years ACF acquired three other companies. They invested \$3 million in the Berrick, PA, plant formerly Jackson and Woodin Co., and started regular production of the first all-steel cars in the world in 1904. Steel cars lasted much longer – there was no wood to rot. It did not need painting; it was less of a fire risk and looked more modern. It became the standard for passenger cars. Previously, they made cars of wood over an iron chassis over bogies.

Bogeys (also spelled bogies) allowed cars to follow railroad tracks more closely. They distributed car weight over eight wheels instead of four. They were sprung and made for a more comfortable ride. Bogies are the reason train platforms are elevated.

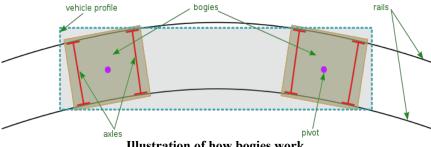
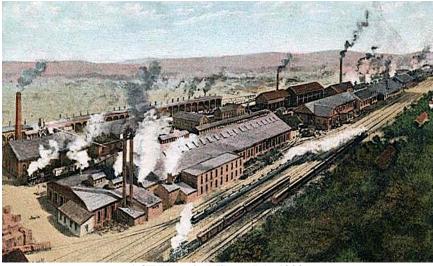


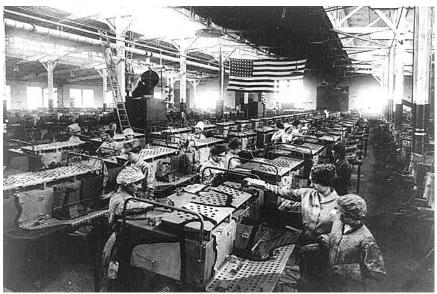
Illustration of how bogies work.



ACF Plant in Milton, PA, 1909.



Refrigerated railroad car manufactured 1911 by ACF. Note advertising.



ACF camouflaging cars in 1914

ACF joined the DJIA in 1902, and became part of the new DJIA 20 in 1916, lasting until 1927. As time went on, they acquired other railroad car manufacturing companies. During the First World War, they built gun mounts and boats, and made ammunition.



Double stack intermodal shipping car. Note bogies are between cars.

In 1922 ACF started building auto carburetors. From 1925 to 1954 they manufactured motor coaches and trolley coaches. During the Second Word War they made tanks, completing over 1,000 tanks before Pearl Harbor. In 1954/5 they changed their name to ACF Industries.

In 1977 the Southern Pacific Railroad started double stack intermodal shipping. This required a 40-foot stretch between bogies with a lowered base to accommodate two steel containers on top of each other. ACF made these cars. The world now has 20 million intermodal containers. Containers are normally eight feet wide, eight and a half feet tall, and 40-feet long. They also come as 8-feet, 10-feet, 20-feet and 53-feet containers (as in the picture). Heights vary up to nine and a half feet tall. Containers have revolutionized shipping and transportation. Intermodal means multiple modes of transport (e.g. ship, rail, truck) without handling the freight itself when changing modes.

The investor, Carl Icahn, bought ACF Industries in 1984. By 1997 ACF owned 46,000 railcars, which it leased mainly to GE Capital Railcar. ACF still manufactures railroad cars, including specialized hoppers, toxic liquid containers and pressurized containers e.g. for LPG. They also fabricate railcar parts, convert cars and repair cars. They do this all at their Milton, PA facility.

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#4. American Locomotive Company (later ALCO). 50 shares to Mrs. Cherry Schacht dated October 1943. Hole and punch cancelled 103 +5.18.65. Seal shows the company was incorporated in the State of New York in 1901.

Note number matrix for number of shares on side.

#1978



**Vignette of ALCO** 

The vignette shows two laureate allegories. The one on the left holds a plumbing line (the modern equivalent of a fluid level) and calipers representing mechanical engineering. The one on the right holds a retort and electric cable representing chemistry and electricity. Between them is the world with their logo, ALCO, over a fast, wing-like modernistic train flying into a cogwheel. This represents ALCO's speedy, sophisticated trains around the world.

Schenectady Locomotive Engine Manufactory merged with seven smaller locomotive works (all but one in Union states) in 1901 to form the American Locomotive Company (ALCO). The exception was the Richmond Locomotive works in Virginia. In 1904 ALCO acquired the Montreal Locomotive Works. The next year they bought the Rogers Locomotive Works in Paterson, NJ, at that time the second largest works after Baldwin (also in the DJIA). But even with Montreal and Rogers, ALCO was still second to Baldwin. Nevertheless, ALCO made 75,000 locomotives. New York Central, Union Pacific and Southern Pacific favored ALCO, and they moved quicker to diesel engines than Baldwin. ALCO became part of the new 1916 DJIA 20 where they remained until 1927.

From 1905 to 1913 ALCO diversified into automobiles with their subsidiary American Locomotive Automobile Company. They stopped in 1913 because it was unprofitable. Guess who the plant manager was? Walter Chrysler, who would later found his own dynasty in 1925.

ALCO made the first roller bearings in locomotives in 1924, which decreased running gear maintenance. They shipped their locomotives all over the world. They also built 25 of the biggest steam engines ever built between 1941 and 1944. During their construction an unknown worker wrote "Big Boy" in chalk on one of the fronts. The nickname "Big Boy" stuck. A restored Big Boy toured the Union Pacific system in 2019 to celebrate the 150<sup>th</sup> anniversary of the transcontinental railroad in 1869.



Exquisite auto made by ALCO in 1912.



Auto advertised by ALCO, under license from Berliet in France 1906.



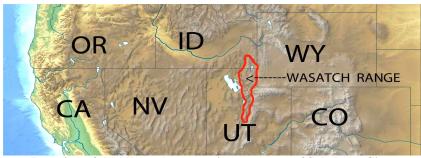
**ALCO Works in Schenectady 1906.** 

Big Boy's engine and tender were 132 feet long and 16 feet high, together weighing 625 tons! They used it to keep up a speed of over 60 mph on mountain runs over the Wasatch Range without needing double headers (i.e. two engines). The Big Boy could haul 4,450 tons up a 1.14° grade. Though many railroads had switched to diesel in the 1940s Union Pacific wanted to use up their low quality bituminous coal from their local mines in Wyoming.



ALCO's amazing "Big Boy" the world's largest steam locomotive 1941-4.

Coal is more efficient than wood. Between 1850 and 1880 the US switched from wood to coal. Coal comes in progressively more energy efficient forms from lignite, to sub-bituminous coal, bituminous coal, anthracite then coke.



Location of the Wasatch mountain range east of Salt Lake City.

After the huge Yates Oil Field opened in Texas in 1926 the US started switching from steam to diesel-electric engines. Coal had an efficiency of 5% in converting to locomotive energy; diesel had an efficiency of 25%.

In 1924 ALCO produced the first diesel-electric locomotive within a consortium: Ingersoll-Rand made the engine; GE made the electrics; ALCO made the body. In 1929 ALCO bought the McIntosh and Seymour Diesel Engine Company and then made their own diesels. They started with smaller switch engines, then once they gained expertise, progressed to locomotives.

Electro-Motive Corp (EMC), who made their own diesels without needing GE, competed with ALCO. ALCO had to partner with GE to compete with EMC. During the Second World War the War Production Board allocated ALCO small diesel switch engines and steam engines while they allocated EMC to larger diesel locomotives. ALCO never caught up after the war. Although they sold 40% of all diesel locomotives in 1948, GE left the partnership in 1953, dissatisfied with ALCO's slowness to compete. ALCO switched to making oil production equipment, heat exchangers for nuclear plants and munitions during the Korean War, changing their name in 1955 to ALCO Products.

By now EMC and GE were the leading diesel-electric locomotive manufacturers. ALCO went into a gradual decline, closing its Schenectady locomotive plant and selling its designs in 1969 to Montreal Locomotive Works (MLW). MLW continued making diesel locomotives, many of which are still used all over the world, notably in India. Eventually Bombardier acquired MLW then sold the diesel unit to Fairbanks-Morse who is still in business. Worthington bought the rest of ALCO Products and merged with Studebaker in 1967, forming Studebaker-Worthington, then McGraw-Edison, then Cooper Industries in 1985.

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4 %22Big Boy%22 Ready for restoration.jpg



#5. American Smelting and Refining Company. Specimen Stock Certificate for 100 shares undated, company incorporated in State of New Jersey. Note serial # 00000, SPECIMEN stamps and hole cancels over signatures. #2091



Vignette of American Smelting and Refining. Identical to ABNCo Vignette on their own Stock Certificate.



ABNCo's own stock certificate showing identical eagle vignette.

In 1887 Robert S. Town started a smelting operation in New Mexico and Texas close to the Mexican border. Two years later the Guggenheim family founded the Philadelphia Smelting and Refining Company in Pueblo, CO, to smelt zinc. They also owned lead and copper smelting operations in Mexico.

In 1898 Henry Rogers, one of the founders of Standard Oil, wanted to smelt copper. He organized the Amalgamated Copper Company to acquire all copper smelters in the US except those owned by the Guggenheims. The next year he

merged with the Guggenheims to form the American Smelting and Refining Company (ASARCO). They incorporated in New Jersey because their laws favored monopolies.

Two years later the Guggenheims bought controlling stock in Asarco i.e. 51% or more. Destined to own mines, smelters and refineries in many states and countries, the Guggenheims later had to manage a toxic pollution nightmare. Though not an original member of the 1896 Dow dozen, the Guggenheims joined them in 1901. When the DJIA expanded to 20 stocks in 1916, they became one of the DJIA 20 where they stayed until 1958.

From 1902 to 1910 they expanded further buying refineries, mines and smelters in Idaho, Washington State, Maryland, Arizona, California, Texas, Utah and Mexico.

In 1906 Mexican workers at the Cananea ASARCO plant in Sonora rioted. Arizona vigilantes, supported by Mexican President Porfirio Diaz, massacred the workers. Twenty-three people died. Of the 10 million Mexican inhabitants at the time, 95% owned no land and worked as virtual serfs. Mexico had virtually no middle class. Just seven American companies owned 75% of Mexican mines and 50% of Mexican oilfields.

Diaz was 76 years old and in his sixth term. When he allowed Americans to kill Mexican strikers, and cow-towed to foreign interests, this angered Mexicans and led to the Mexican Revolution in 1910.



Open Asarco mine near Garfield, Utah in 1942.

Something else happened in 1910. ASARCO had their first suit in Solano County, California. Farmers complained that sulfur dioxide was destroying their crops. ASARCO solved it by building higher chimneystacks. This became their preferred way to continue polluting. Of course, it simply spread it out over a wider area! From 1910 to 1940 ASARCO bought more mines in Mexico, Chile, Canada, Australia, West Africa and Saudi Arabia. They also formed a company to mine copper in Bolivia. In 1954 they bought an open pit copper mine in Silver Bell, Arizona and next year a smelter in Hayden, Arizona.



Tall Asarco smokestacks in Smeltertown, El Paso. They demolished it in 2013.

In 1967, it seemed they almost recognized Mexico as its own sovereign country rather than as a colony of America. They reorganized Asarco's Mexican mines and plants as Asarco Mexicana. They sold 51% of the stock to Mexico.

In 1970 the US Congress passed the Clean Air Act. Two years later officials showed an ASARCO smelter caused high lead levels in El Paso schoolchildren. ASARCO settled with a trust fund and demolished Smeltertown, in El Paso.

In 1980, the US Congress passed the Superfund Act, which funded the clean-up of designated hazardous or polluted sites. ASARCO's smelter at Ruston, Louisiana closed the same year. A year later ASARCO closed the zinc plant in El Paso and four years later the leadplant there. Further plant closures followed when the EPA declared so many of ASARCO's sites as superfund sites, which cost ASARCO millions.

In 1989 the United Steelworkers Union publicized ASARCO's systematic under-reporting of Hispanic worker health problems chiefly from arsenic poisoning. Twelve years later ASARCO settled a class action lawsuit for lead

poisoning for \$4.8 million. After continued pressure ASARCO closed all El Paso plants.

In 2002 Grupo Mexico (ASARCO's former subsidiary) bought ASARCO for \$2.2 billion, as well as ASARCO's South Peru Copper Corporation for \$2.5 billion. ASARCO was required to set up a \$100 million trust fund for pollution offenses. By 2005, when Asarco declared bankruptcy, it owned over 90 US sites with pollution issues, and 22 superfund sites! In 2009 ASARCO emerged from bankruptcy and reintegrated with Grupo Mexico.

In summary ASARCO produced raw materials especially copper with huge holdings of mines, smelters and refineries that seemed unproblematic around 1900. As time went on their pollution (and their denial of it) grew out of control. But Grupo Mexico was able to evade much of the responsibility and reacquired them after their bankruptcy.

As is so common in US's jackpot litigation mentality, the vast majority of people who suffered heavy metal poisoning got no redress, even more so in Mexico.

As an aside, in the US medical system patients who suffer disability or death from medical mistakes in the vast majority of cases also get no redress. Trial lawyers know which cases they can and cannot win, and precious few are litigated. When a baby is born with defects caused by a medical mistake, the occasional parent wins a bonanza, but the majority suffer in silence. In 1998, when Tiffany Applewhite was 12, she suffered a cardiac arrest. But the ambulance had no advanced life support equipment, and as a result she developed severe brain damage. Sixteen years later in 2014, a jury ordered the City of New York to pay her \$173 million. Bonanza! But what about all the others?!

The only real winners seem to be the lawyers. Lawyers got 80% of the 1997 \$4.8 million class action suit against ASARCO for lead poisoning. A better system would be for administrative law judges with both medical and law degrees to award smaller benefits to a far larger number of people. If you had severe brain damage, and it was the fault of nature, you could still get help. If it was the fault of a company or a physician, you could still get help, rather than a 1% chance of a bonanza. Malpractice premiums cost Americans \$10 billion a year, but defensive medicine costs \$45 billion a year. \$55 billion would easily cover such a fair system. The physicians and companies could still be censured and fined.

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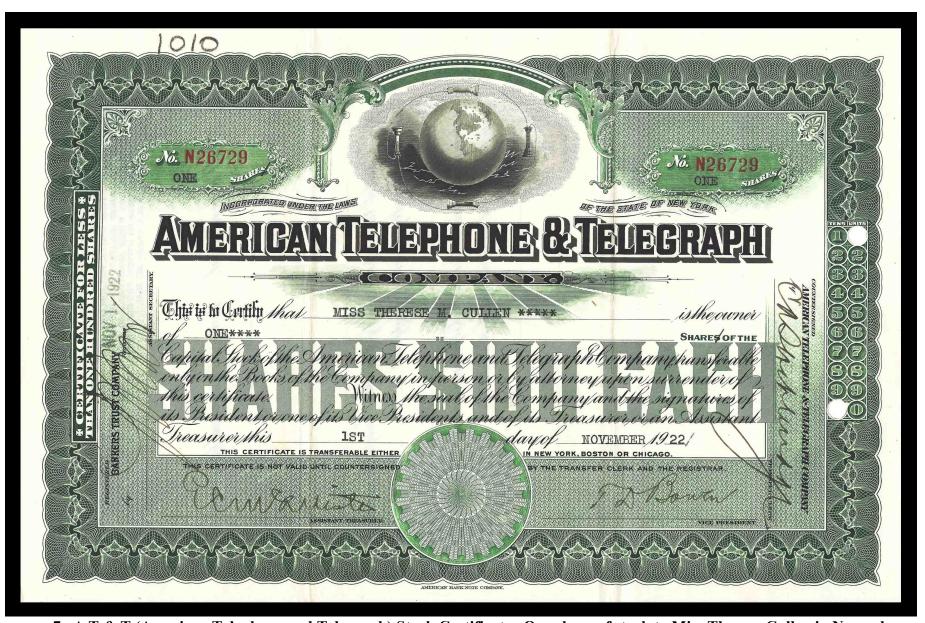
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7. A T & T (American Telephone and Telegraph) Stock Certificate. One share of stock to Miss Therese Cullen in November 1922. This is uncancelled – the two holes on the number matrix on the right simply confirm the number of shares.

One wonders whether this was given to someone's daughter as an encouragement to develop an interest in the stock market in the swinging twenties.

#1883

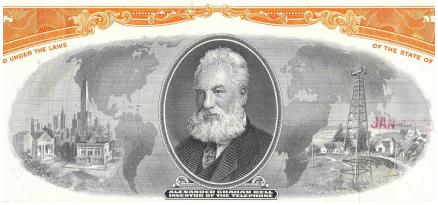
Note this is company #7 of the 20 in the DJIA 20. Number 6 was American Sugar, which was dealt with in the last chapter.



Vignette showing old style telephone mouthpieces circling the globe, joined by wire in series. Lightening behind represents electricity. By Charles Brooks, an engraver who worked from 1928 to 1966 ending up in the BEP.



Another AT&T stock certificate for 182 preferred shares at par value of \$33.33 each October 1959. Stamp and hole cancelled.



Vignette showing Alexander Graham Bell inventor of the telephone over a map of the world. Left is a city; right is a village with telegraph poles and sea in background and what looks like a radio tower in the foreground.

In 1847 Alexander Graham Bell was born in Edinburgh, Scotland to Eliza Bell and Professor Alexander Melville Bell, a speech therapist. Eliza later became deaf and the boy followed his father into the speech therapy business. His father invented a system of phonetic symbols called visible speech, which enabled anyone to pronounce any word in any language. Undistinguished at school, the 15-year-old boy left to stay with his grandfather in London, who insisted on proper elocution, and instilled into him a love of learning. Alexander Graham graduated from Edinburgh University aged 21, and two years later immigrated to Canada with his family.

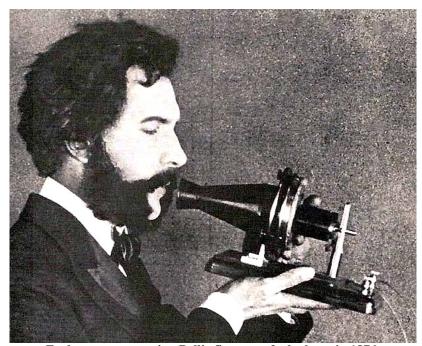


Alexander Bell with his wife, Mabel Hubbard, and two daughters ca. 1885.

After arriving, Bell joined the Boston School for Deaf Mutes as an instructor. Helen Keller was one of his students. Boston University appointed him Professor of Vocal Physiology and Elocution in 1873. He gave up his lucrative private practice to concentrate on experiments. He kept only two deaf private pupils, one of whom was Mabel Hubbard ten years his junior, whom he married. Her father, Gardiner Hubbard and another wealthy patron, Attorney Thomas Sanders, bankrolled Alexander's experiments. This enabled him to hire Thomas Watson, an electrical researcher. You can hear Bell's indistinct voice on YouTube by entering "Hear my voice Alexander Graham Bell".

In 1876 Alexander patented the telephone. But Western Union had hired Elisha Gray who also patented a telephone. After a bitter legal battle lawyers declared Bell the winner. At the time Telegraph and Morse code connected the US from coast to coast, and had been around for 30 years.

Bell initially tried multiplexing several messages along the same line using different frequencies, which he called the "harmonic telegraph". But his assistant Thomas Watson pushed voice transmission. In 1876 Bell said to Watson in the next room over a telephone wire "Mr. Watson come here; I want to speak to you".



Early actor portraying Bell's first use of telephone in 1876.

Bell, his father-in-law and Attorney Sanders, formed the Bell Telephone Company in 1877. The next year the first telephone exchange started in New Haven allowing 21 subscribers to route local calls.

In 1879, the three investors sold their stock in the Bell Telephone Company to Boston financiers who formed the National Bell Telephone Company. Western Union, the telegraph company, sued them for patent infringements, but settled in November that year. Western Union sold its 56,000 telephones to Bell, who paid them 20% royalty on telephone equipment leases for 17 years, and Bell Telephone agreed not to do any telegraph business.

For 5-10 years National Bell spent no money and simply licensed many local companies to promote the telephone. Local companies only had to pay National Bell \$20 a year per telephone. In 1880 National Bell changed their name to American Bell Telephone Company and tried to get local companies to sign a permanent license with Bell. Bell would own 30-50% of each company - rather like franchising. Each local company could build lines within their territory but could not connect with other local companies.

In 1881 American Bell acquired Western Electric (WE) who had supplied electrical goods to Western Union. Now Bell had their own manufacturing company. By that point in time, most major US cities had telephone exchanges.

In 1884 American Bell built a line between Boston and New York and a line between New York and Philadelphia. The next year they realized long distance would be expensive, so they formed a subsidiary, American Telegraph and Telephone, to finance long distance line building. A severe blizzard in 1888 knocked out many lines. So, AT&T floated \$2 million in bonds to build more lines including underground cables. In those early days, long distance lines were very muffled and very expensive.

Many of Western Union's telegraph wires were single using the ground as a return. Western Union contracted out their wires for early telephones. AT&T soon replaced single wires with double wires as this eliminated crosstalk and hum from nearby AC wires. The first phones were boxes with only one mouth and earpiece, and you had to keep switching back and forth between the two.



American Bell's long distance network in 1891.

Initially, each phone needed its own battery and regular inspection visits. By1888, a large central battery operated all numbers on each local exchange. Three years later American Bell invented the first automatic dialing system, replacing telephone operators.

In 1894 Bell's 18-year patents expired. But American Bell had a major start. Independent companies popped up all over the place - 6,000 of them between 1894 and 1904. Not only that, in the west independent electrical companies sprang up to manufacture the independents' equipment.

As an 11-year-old in Cyprus, I had a field phone, which enabled me to speak to my friend next door with a wire between and no battery. This used a diaphragm, which vibrated a coil of wire in the field of a permanent magnet, creating its own weak current. Some early phones were like this but most used the Edison/Berliner carbon transmitters invented in 1877/8. This used two metal diaphragms with carbon granules between them and a current passing from one side to the other. When one diaphragm vibrated, it changed the resistance and amount of current that flowed through the agitated carbon granules, generating a voice-modulated current. This system continued in use until the 1980s.

After the one-piece boxes came "candlestick phones". These started in 1895 with no dial on the base. Previous phones had an on/off switch to start them. Later you had to crank a magneto, which rang a bell in the exchange. Then the candlestick used an earpiece holder that was the on/off switch. To receive or send a call you took the earpiece off the cradle. This started the flow of current through the phone calling the exchange, which saw a light, signaling contact. Dialers created on/off pulses, activating solenoids in the exchange. Later they used electronic rather than electro-mechanical routing.



Candlestick phone without dialing base started 1895 left, with dialer 1919.

AT&T decided to expand quicker. By 1899 American Bell had 800,000 telephones. Their headquarters were in Massachusetts, the land of copious regulations. So, they decided to move to New York City, the land of laxer regulations. AT&T then became the parent company and Bell the subsidiary.

AT&T were growing their long distance lines, but independents were cutting into their profits with rates often half that of AT&T. In 1907 AT&T only owned half of US phones and had debts of \$200 million. In 1903 J.P. Morgan started trying to gain control of AT&T from the Boston financiers, using New York City and London investors. By 1907 he had succeeded. But once Morgan controlled AT&T things did not look so good. AT&Ts public image was terrible. Service was terrible. And its debt was terrible.

AT&T President Vail changed their corporate strategy, but it took him ten years. They slashed rates and switched from arrogant service to customer-centric service. Vail invested in R&D, later founding Bell Labs. He balanced profits versus customer satisfaction. And he pushed their monopoly even further. AT&T bought 30% of Western Union stock and Vail became Western Union's President too. If telephone lines were down, they could use telegraph lines instead. Vail bought up independents by having Morgan squeeze them. Morgan's people were good at that!

Then in 1913 the government talked about breaking up their monopoly. Vail sold Western Union and allowed independents to use AT&T's long distance lines. The government backed off.

Also, in 1913 Lee de Forest, inventor of the vacuum tube ran short of cash. He sold his patents to AT&T for the bargain basement price of \$50,000. His triodes enabled enormous amplification of telephone signals and allowed practical long distance calling for the first time. All of a sudden AT&T's greatest asset, its monopoly on long distance service, became golden. Long distance signals, previously muffled, now sounded loud and clear using the vacuum tube repeater.

That same year, to preserve its monopoly, AT&T made the Kingsbury Commitment with the government. This meant AT&T agreed to connect all independents to their long distance system and stop competing with Western Union's telegraph operations.

In 1915, Bell called from New York City to his assistant Watson in San Francisco using AT&T's vacuum tube repeaters. And what do you think he said to him? "Mr. Watson come here, I want to speak to you", exactly as he had said in 1876 in a room next door with the first recorded telephone call!

Six years later, the Graham Act exempted telephony from the Sherman Antitrust Act. Independents, Radio Corporation of America, GE and Westinghouse were all plugged into AT&T's long distance lines. AT&T also had 17 radio stations.

In 1925 AT&T started Bell Labs, which would pioneer a host of inventions, notably the transistor, photovoltaic cells, radio astronomy, the Unix operating system and C programing language. In 1927 AT&T opened the first two-way radio transatlantic telephone calls, costing \$15 a minute!

Also, in 1925 AT&T started the first cradle held phone with a dialer base. This had no internal ringer; the ringer required a separate housing.

The Model A1 (1925-1927) and Model B1 (1927-1930) had a circular base, and a lot of unpleasant feedback. The D1 had an oval base, an anti-feedback circuit, and included a ringer.



Western Electric D1 telephone, rotary dial, cradle handset and ringer.

AT&T flirted with investments in cinema, radio and television. In 1929, AT&T had \$1 billion in annual sales, the greatest ever for any corporation at the time. Then the Great Depression struck. By 1933, their sales were only \$70 million. But, gradually, sales picked up again. By 1939 AT&T controlled \$5 billion in assets, more than any other corporation in history. In 1937 the more modern-looking Model 302 appeared.



Western Electric 302 desk phone 1937-1958 with thermoplastic case.

Bell Labs helped in wartime radar development during the Second World War (1939-1945). After the war AT&T had a huge lead in microwave radio relay technology that became the chief means of long distance TV and telephone transmission. In 1947 Bardeen, Shockley and Brattain, working at Bell Labs, invented the transistor, which replaced vacuum tubes and won them each a Nobel Prize. The next year AT&T started building a system of microwave relay towers for long distance. It would take another 30 years to complete.

In the 1930s, the FCC had pushed for a split up of AT&T, but the government shelved the idea during the Second World War. The Department of Justice (DOJ) filed a suit in 1949 but AT&T delayed the case. The Eisenhower administration was not keen to push it either. Finally, in 1956 AT&T agreed to restrict business to national telephony and government work. This effectively prevented them entering the computer market. The consolation prize was for Western Electric to manage a huge advanced weapons research lab under Sandia Corporation. AT&T thus became vital enough that the government protected it from anti-trust suits. At war's end, 50% of households had telephones. By 1955 the number was 70% and by 1969 90%. For years the government and AT&T had wanted every US household connected by telephone.



Model 500 Western Electric Phone 1949 - 1984.

Early in the 1950s AT&T developed technology to dial direct for long distance without needing to be connected by an operator. In 1955 AT&T, partnering with UK and Canada, laid the first transatlantic telephone cable. During the

post-war boom teenagers phoned each other in unprecedented call volumes markedly increasing profits. In 1963 AT&T offered touch-tone dialing, and in 1966 they offered phones in colors other than black! In 1968 they offered the Trim-line phone with a dial in the handset.



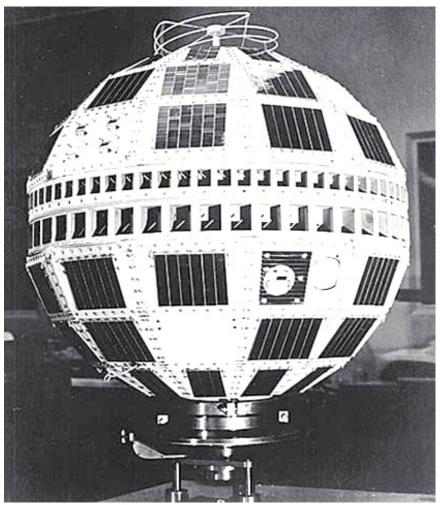
A 220 Trimline phone with rotary dial and moving finger stop in handset 1965.



Western Electric 1500 phone, 10 buttons 1963-7. 12 button 1968-1984.

In 1968 the FCC allowed non-Bell equipment to be hooked to AT&T lines opening the market to fax machines, cordless phones, answering machines and

later to dial-up internet. The Bell Labs had been researching satellite programs and in 1962 they launched the Telstar and Comsat satellites. During the 1950s and the 1960s AT&T spent \$500 million to introduce electronic switching instead of electro-mechanical solenoids, which allowed a vast increase in volume in the 1970s.



AT&T Telstar Satellite 1962 for international calls.

In the 1950s and 1960s when I lived in UK, I never made long distance calls because of the expense. Even in the 1970s in the US, long distance calls were still expensive and reserved for urgent communications not for chatting. In the late 1970s I used to chat to my father-in-law across the Atlantic via Ham radio instead. Our usual telephone bill was \$100 a month but one month in the mid-1980s it was \$500. Our daughters had discovered that they could chat long distance with their friends! That was then the average weekly working wage!

AT&T profits were phenomenal, and they squelched competition. But in the 1970s businesses started buying phones from their competitors. MCI (Microwave Communications Inc.) filed an anti-trust suit against AT&T in 1974. But in Trump-speak, AT&T had bigger buttons than DOJ and they were able to put off the suit for seven years. By 1981 AT&T's profits were \$6.9 billion, the highest ever for any company at the time.

The courts broke up Ma Bell effective January 1st, 1984. Before the break-up AT&T, the largest corporation in the world, had assets of \$155 billion. After the break-up, they had only \$34 billion. It was Standard Oil all over again (broken up in 1911). Ma Bell became seven "Baby Bells", but AT&T kept Southwest Bell. In return, the government rescinded the 1956 consent decree (that AT&T could only engage in telephony or governmental business).

The new AT&T had three sections: AT&T Communications (long distance business), AT&T Technologies (Western Electric) and they started a new section - AT&T information systems to get into computers. US customers no longer had to rent their telephones. Imagine that! For 100 years AT&T's cash cow was renting not selling their telephones. Competition and fiber optics in the 1980s reduced prices by 40%, but volume increased by 250%!

MCI eroded AT&T's long distance market because they could now compete. AT&T once controlled 98% of the long distance market. By 1988 they controlled only 68%. US Sprint was another long distance competitor.

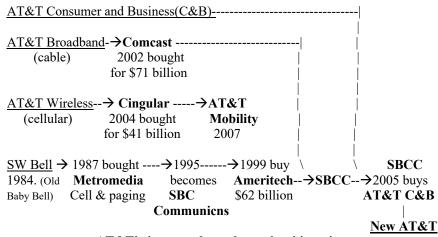
AT&T now sold equipment abroad, got into computer systems, got into international calls, and laid fiber optic cables (starting in the 1980s). Then the slicing and dicing started. Acquisition sickness took over. A stream of confusing acquisitions, spin offs, splits, mergers, sell-offs and baptisms under arcane new names, followed. In the 1980s the disease became endemic in much of corporate America!

In 1991 AT&T bought NCR (National Cash Register) Corporation for their computing expertise for \$7.4 billion. Three years later they bought McCaw Cellular Communications (MCC) for \$12 billion for their cellular network, which covered one third of the US at the time. AT&T's re-christened their old manufacturing business Western Electric "AT&T Network Systems".

Still AT&T struggled. In 1995 they spun themselves into three new companies, AT&T (who wanted to differentiate into data, video and voice communications), Lucent Technology (mainly Bell Labs), and NCR (computers).

The next year Congress passed the Telecommunications Act which ended monopolies for local telephone companies (the earlier Baby Bells). Two years later AT&T bought TCI (TeleCommunications Inc.) for \$50 billion giving AT&T 10 million local telephone subscribers. That was \$5,000 per subscriber! What were they thinking! Then they bought MediaOne, another cable provider.

In 2001 AT&T split into three companies: AT&T Consumer and Business, AT&T Broadband and AT&T Wireless. Because it is so complicated, I created a diagram to show how the slicing and dicing worked from 2001:



### AT&T's journey through spaghetti junction.

In 2007 the new AT&T bought Cellular One, then bought Centennial Communications Corp. Then in 2011, they bought Spectrum from Qualcomm, and tried buying T mobile, but the DOJ blocked it. AT&T then sold their Connecticut business to Frontier Communications. Then they bought DirecTV and NII Holdings in Mexico. That same year Apple displaced AT&T from the DJIA. In 2018 AT&T bought Time Warner.

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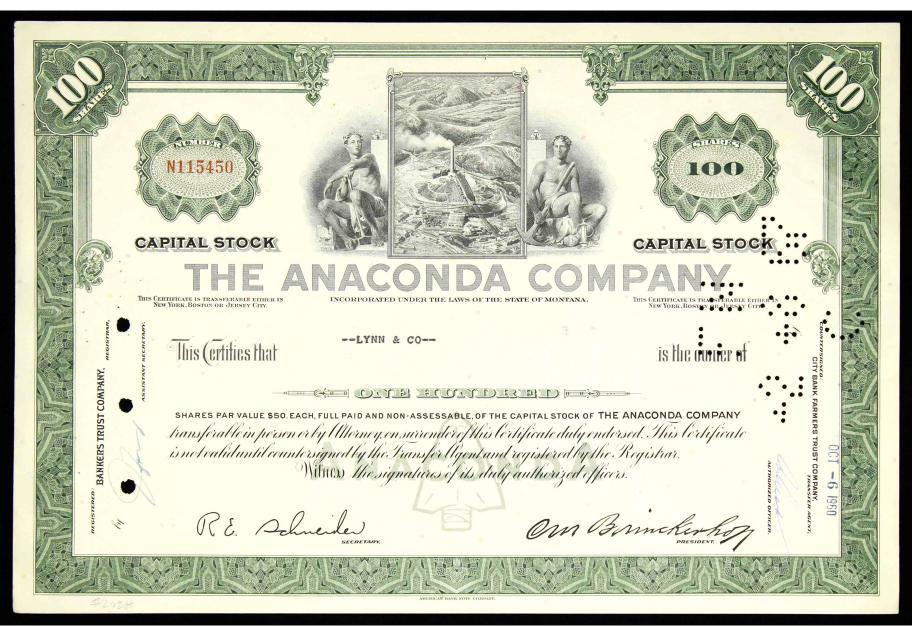
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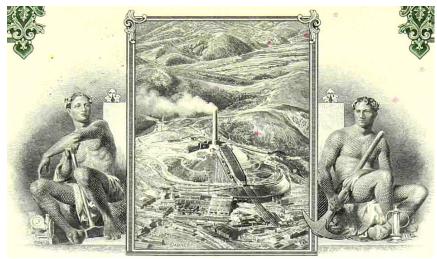
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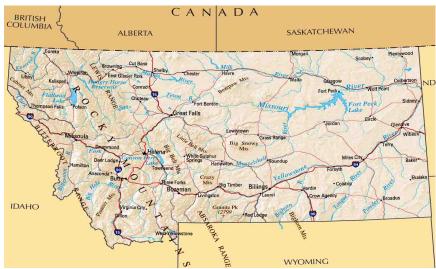
#8. Anaconda Company. 100 shares to Lynn & Co. October 1960. Hole and punch cancelled FN | 2+ 8 67 | C. Incorporated in Montana. Printed by ABNCo. #1915.



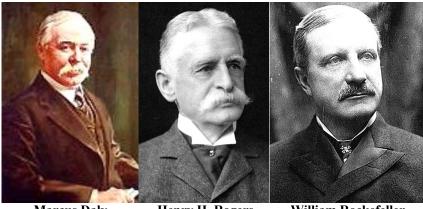
Vignette of Anaconda Mines.

The vignette shows two laureate youths, one with a hammer and other with a pickaxe and lamp. Between them is the Anaconda open-pit copper mine.

In 1881 Marcus Daly, an Irish immigrant and geologist, bought a played-out silver mine near Butte, MT while working as a mine manager for Walker Brothers in the area. Daly, realizing its high copper yield, offered it to his bosses, who refused. So, Daly sold his interest in Walker Brothers and bought the mine for himself. After reading Horace Greeley's account of how Gen. U.S. Grant surrounded Gen. Lee's army "like an anaconda", Daly liked the description and called his company "Anaconda". An anaconda is a semi-aquatic snake.



Map of Montana, showing Butte, Anaconda and Great Falls.



**Marcus Daly** 

Henry H. Rogers

William Rockefeller

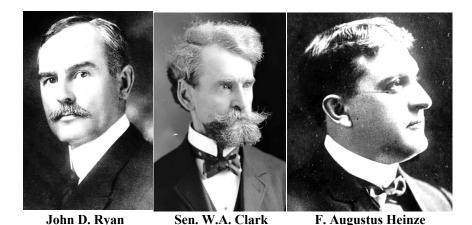
Daly asked his friend George Hearst, a San Francisco investor and father of William Hearst, to help. Sight unseen Hearst bought a 25% share. Daly, as a geologist, realized that other played-out silver mines in the area were great copper mines and quietly bought them up too. After Union Pacific came to Butte in 1881, he built a smelter there. Butte became a boomtown in the 1890s. But the smelter's fumes were toxic. So, Daly, by now a wealthy man, built another smelter 30 miles away in a town he called Anaconda and built a railroad to carry the ore there. Plus, he built another smelter at Great Falls, MT.

Daly's Anaconda Copper Company was to produce \$300 billion of copper over its life. Years later in 1895, the Rothschilds bought 25% of their stock. Two speculators from Standard Oil, Henry H. Rogers and John D. Rockefeller's brother, William, (pictured above) decided on a fantastic stock scheme. In 1899 they agreed to buy Anaconda mines from Daly for \$39 million as long as he left the check deposited in a National City bank untouched for a specified time.

Rogers and Rockefeller then set up Amalgamated Copper Mining (ACM) with \$75 million of stock certificates printed for the occasion. Rogers and Rockefeller then borrowed \$39 million from the bank, using the \$75 million stock as collateral, to pay Marcus Daly his \$39 million! Then they sold the stock in ACM and pocketed the remaining \$36 million! To be fair, the bank likely insisted they have at least significant deposits from sale of stock before cashing the check!

Marcus Daly became President of ACM, which owned Anaconda. He must have been a workaholic because \$39 million was a boatload of money in 1889. He died in 1900. There were three copper kings in Butte at the time: Marcus Daly, F. Augustus Heinze, and William Clark.

Daly's widow developed a close friendship with a businessman John Ryan. ACM then asked Ryan to become ACM president and to create a copper monopoly in Butte. Ryan managed to persuade Heinze, owner of United Copper Company, to be bought out. The third copper King, William Clark, was desperate to be a US Senator. After bribing the Montana State Legislature to elect him, he served an uninspired tenure from 1901 to 1907. But ACM never got its monopoly.



William Rockefeller's ACM partner, Henry Rogers, died in 1907. So, William replaced him with his son Percy to manage ACM. Ryan, as President of Anaconda, had a laissez-faire relationship with Anaconda. In 1915 ACM changed its name to Anaconda Copper (AC) and became the world's largest copper producer. In the 1920s metal prices increased. Anaconda found they could also extract manganese and zinc from their ores. In 1922 they acquired mines in Mexico and Chile including the Chuquicamata mine in northern Chile, the largest copper mine in the world, which Ryan bought for \$77 million. AC also bought American Brass Company, the world's largest brass fabricator, boosting their vertical integration. In 1922 William Rockefeller died leaving his son Percy as a partner.

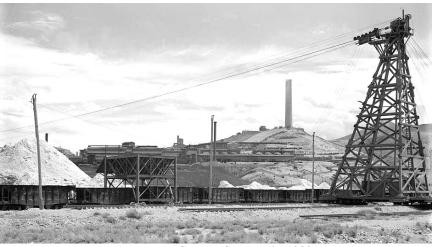


Chuquicamata Copper Mine in Chile in 1920.

In the 1920s Anaconda owned several Montana newspapers, effectively gagging journalists from any anti-Anaconda stories. The phrase "copper collar" described journalists, politicians and individuals whom Anaconda gagged. Anaconda manipulated the Montana legislature by laying off 15,000 men in 1903 until it passed laws they wanted! By 1926 Anaconda Copper was the

fourth largest company in the world. Not surprisingly they joined the DJIA 12 in 1915 and the DJIA 20 in 1916 where they stayed until 1924.

In 1928 Ryan and Percy Rockefeller manipulated ACM stock, using a method called "pump and dump". First, they flooded the market with copper to drive down the price of copper and the share price. They bought 1,500,000 shares at \$40 in December 1928 (total price \$60 million). Then they pumped up the price of copper and of the stock by reducing the supply of copper. When the stock price went up to \$128 in March 1929, they sold (total sales \$192 million). They made \$130 million from this scheme. That means others lost \$130 million. At the time this was not illegal. A Senate banking committee in 1933 called it the greatest fraud in history and a leading cause of the 1929 Wall Street crash.



Anaconda Copper Smelter in 1939.



**Anaconda Copper Mines in Butte 1942.** 

After the Wall Street Crash of 1929 copper prices fell from 30¢ to 10¢ a pound. When Ryan died in 1933 the stock that had once reached \$128 stood at only \$4.

World War II (1939-1945) increased demand for copper for ordnance, casings, wiring, etc. But after the war, demand dropped again, and copper prices fell with it. Anaconda made an unwise investment in 1941 buying a copper mine in Nevada, which turned out poorly. The Butte mine closed in 1947. So, Anaconda asked its engineers to develop new ways of profitable mining. The engineers came up with the GBP ("Great Butte Project"). This involved a block caving method that started in 1948. It helped for a few years, but eventually open pit mining became the cheapest method that started in the 1950s.



Berkeley open pit mine at Anaconda in Butte 1979. One mile long, half a mile wide, and 1,780 feet deep.

In 1952 Anaconda bought an aluminum reduction plant in Columbia Falls. In 1955 they changed their name from Anaconda Copper to Anaconda. They now sold copper, aluminum, manganese, zinc and other metals. From 1959 to 1976 Anaconda was back in the DJIA 30 again. In 1971 Chile's President Allende expropriated the Chuquicamata mine, though when Pinochet later came to power in 1973, he paid Anaconda \$250 million for it.

In 1977 the Atlantic Richfield Company (ARCO) bought Anaconda for \$700 million. They had hoped Anaconda would help ARCO start a shale oil business. Gas prices in the US have always fluctuated, but the US thought it could make their own gas from shale oil. But OPEC strategically flooded the market with cheap oil soon after, thwarting ARCO. In 1980 Anaconda's plants closed. BP bought ARCO in 2000.

The EPA designated the Clark Fork River Basin as a Superfund site extending over 300 square miles because of heavy metal contamination and dumping around Butte, ACM's home territory. The EPA also designated the Nevada

Anaconda mine covering 5 square miles, a superfund site. In 2013 the EPA ordered ARCO to pay \$21 million for past cleanups of Anaconda sites. In 2018 the EPA, DOJ, State of Montana and ARCO reached yet another settlement for the final cleanup of the Anaconda Smelter Superfund site.

The case is still not over.



Nevada Anaconda open pit copper mine filled with rainwater and EPA superfund site.

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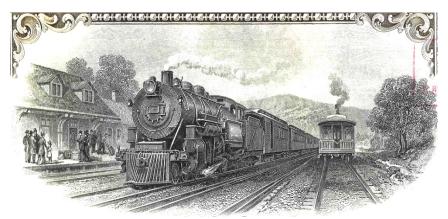
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#9. Baldwin Locomotive Works Specimen Common Stock Certificate. SPECIMEN Stamps over facsimile signatures, 00000 serial number, hole cancelled. They incorporated 1911 in the Commonwealth of Pennsylvania. #1935

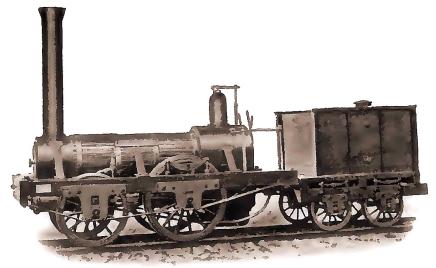


ABNCo. vignette of Baldwin Locomotive Works Stock Certificate showing station, departing train, and back of another train.

Matthias Baldwin (1795-1866) was a son of a wealthy carriage builder. At the age of 16 he apprenticed as a jeweler. After five years he left to move with his mother to Philadelphia as a journeyman jeweler. He developed the process of rolled gold, which he never patented. Previously goldsmiths had to apply gold leaf by hand to metal objects, a time-consuming process.

In 1825, aged 29, (the same year Stephenson invented the steam engine in UK) Baldwin partnered with a metal worker, David Mason, because the jewelry business was going nowhere. They manufactured bookbinding equipment.

Two years later, aged 32, he created a 5 horsepower steam engine to drive machines because available steam engines were problematic. Before that, workers shaped metal by hand, grinding and drilling. It took time.



Old Ironsides 1832 built by Matthias Baldwin of iron and wood.



Matthias Baldwin.

Aged 35 Baldwin made an experimental locomotive that they displayed in Peale's Museum in Philadelphia. The next year in 1832, he built Old Ironsides for the Philadelphia, Germantown and Norristown Railroad. His business increased. The first US built steam locomotive was the Tom Thumb built by the Peter Cooper for the Baltimore and Ohio Railroad in 1830.

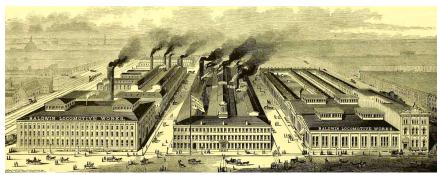


**Vignette of Tom Thumb from B & O Stock Certificate of 1837.** 



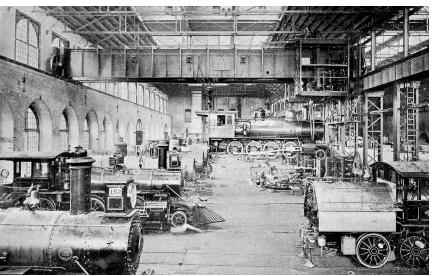
<u>B&O Stock Certificate to Royal Makepeace for twenty shares of stock</u> <u>dated November 1837 with Tom Thumb vignette. Pen and cut out cancels.</u>

In 1835 Baldwin established a school for African American children in Philadelphia and paid the teachers' salaries out of his own pocket. He was an avid abolitionist. By 1837 he employed 300 machinists making 40 locomotives a year. By 1850 railroad building was becoming a national obsession. The Bessemer process in the late 1850s replaced iron with steel. By 1857, Baldwin employed 600 men to whom he paid piece rates to increase output. The financial panic of 1857 made him lay off workers. The remaining workers unionized and struck in 1860. So, he replaced staff with apprentices and non-union workers. During his life Baldwins made 1,500 locomotives.



Baldwin Locomotive Works 1869 in Philadelphia.

By 1866, the year Baldwin died, his company was second only to Rogers Locomotive and Machine Works. Within four years Baldwin became number one, remaining the largest locomotive manufacturer in the US for decades. They also exported locomotives to Russia, Europe and Australia.



Interior of Baldwin Locomotive Works Philadelphia 1896.



Baldwin Locomotive Works Philadelphia 1900.



**Baldwin Locomotive Works Philadelphia 1910** 

Baldwin's shops in Philadelphia covered 196 acres or eight city blocks. By 1906 space was cramped and locomotives were getting larger. They made 2,666 locomotives in 1906, with 17,000 staff round the clock. They determined they had to move. They did so gradually to a 616-acre site in Eddystone, PA between 1906 and 1928. The new building had a capacity for 3,000 locomotives a year.



Employees outside the BLW Philadelphia 1910 during strikes.

But the move was premature. Samuel Vauclain, President of Baldwin pushed the move to Eddystone to prepare for the next boom that never came. In 1906 the Hepburn Act revitalized the Interstate Commerce Commission and capped railroad rates. Railroads responded by not updating their locomotives. In 1908 Baldwin only made 614 locomotives. Baldwin decided to incorporate in 1909 as Baldwin Locomotive Works (BLW). Their IPO was in 1911, the same date as their incorporation. It raised money for the move to Eddystone. Baldwin joined the DJIA 20 in 1916 and remained there till 1924.



Samuel Vauclain, President of BLW in 1930.

From 1909 to 1911 in Philadelphia workers struck continuously as laborers struggled to unionize. In June 1911, 70% of Baldwin workers went on a sympathy strike with city transport workers. That month in Philadelphia 45,000 went on strike. Philadelphia at the time had a population of 1.5 million.

During the First World War (1914 to 1918), Baldwin built 5,551 locomotives and made two million rifles and six million artillery shells for the war effort. After the war Baldwin went into decline. They partnered with Westinghouse to try to make diesel-electric locomotives, but Westinghouse opted out after 1929 when the Great Depression hit. Samuel Vauclain gave a speech in 1930 predicting that steam locomotives would dominate for 50 years. Wrong! Five years later Baldwin declared bankruptcy. It is good to have vision, but it must be the right vision! The last straw was the Pennsylvania Railroad selecting GE's diesel-electric locomotives over Baldwin's engines.

Baldwin reorganized in 1938, again trying unsuccessfully to revive steam locomotives. They also made an unsuccessful foray into steam turbines. During the Second World War, the US War Production Board dictated that Baldwin and ALCO both produce steam locomotives, and that GM's Electromotive Division produce diesel electrics locomotives – the locomotives of the future. Baldwin and ALCO never caught up with GM's post-war advantage.

By 1950 demand for steam locomotives was dead. In 1948 Westinghouse Electric again partnered with Baldwin for five years to create a successful diesel-electric locomotive, but still without success. In 1956 Baldwin closed the Eddystone plant. They went into heavy construction equipment instead. Autos, trucks, the interstate highway and air travel became the transport of the future. During its existence Baldwin had produced 70,500 locomotives. In 1965 Armour & Co. bought Baldwin, and in 1970 Greyhound bought Armour & Co.

When you ask someone today who the big three are, a millennial might say Amazon, Alphabet and Apple – the three A's. If you were to ask a baby boomer the same question, they might say GM, Ford and Chrysler. But if you had asked the same question in the early 1900s the answer would have been Baldwin, ALCO and Lima (another locomotive works in Lima, Ohio). That was a different era!

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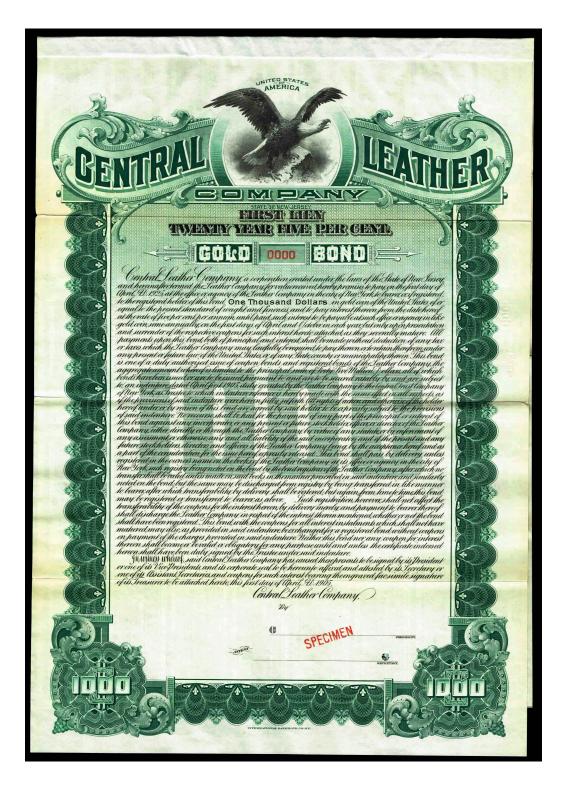
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## Previous page: #10. Central leather Company Specimen 20 year 5% gold bond dated 1905. Stamp cancelled SPECIMEN, unsigned, Serial #00000. Registered in New Jersey and printed by International Bank Note Co. NY. #1998



Central Leather Company Vignette, spread-winged eagle on a rock, likely a stock vignette.

I have already dealt with Central leather in Chapter Four with the 1896 Dow dozen as US Leather. US Leather overcapitalized, and could not recover from this with their promise of excessive dividends. Additionally, they had no real monopoly, and no advantages of scale.

To recap what I said about US Leather merging with Central Leather:

US Leather reorganized in 1904 after 11 years in business, unable to pay promised dividends on their preferred stock, without a monopoly, and without economies of scale. But nothing changed. They could not dig themselves out of their financial hole. So instead, after four years of negotiations, they merged in 1909 with the Central Leather Company, which also incorporated in New Jersey. One wonders whether this Central Leather bond issue in 1905 was to buy out US Leather at the time.

In the 1910s Central Leather held its own but in the 1920s they lost it. Central Leather and US Leather Company both made only thick sole-leather. Demand for harness leather for horses fell as auto production rose. Factory belt drives also used sole leather. And unfortunately, just then, rubber belts replaced industrial leather belting.

Central Leather had bought up land for hemlock forests to harvest their tannin. But recall chromium salts took over in the 1930s. So, they re-purposed their lands for coal, gas, hunting clubs, and State land agencies.

In 1927 they changed their name back to US Leather Company. In 1952 they liquidated, the only original Dow dozen company to do so (as of 2007). They quitclaimed the remaining assets to Keta Gas and Oil and stockholders received one share of Keta Gas and Oil per share of US Leather.

Keta then sold out to Swan-Finch Oil Co.in 1955. Shareholders got one share in Swan-Finch for each share in Keta.

So, the sequence was:

US Leather ->Central Leather ->US Leather ->Keta Gas & Oil ->Swan-Finch
Oil

Lowell Birrell was a lawyer who gained control of 40 companies including Swan-Finch Oil Co., the grandchild of Central Leather. He left ten of the companies bankrupt or insolvent. He used complex transactions, issuing stock and merging companies. Sometimes he simply looted their bank accounts. He was one of the biggest stock manipulators in the 1950s.

In 1957 he fled to Cuba, then to Brazil with \$3 million in cash. A New York Grand jury found him guilty of stealing stock valued at \$14 million from Swan-Finch Oil and Doeskin Products. Birrell returned to US in 1964 when he ran short of cash. The SEC called him "the most brilliant manipulator of corporations in modern times". A website called "The Con Artist Hall of Infamy" registers him as one of their inductees! He spent several years in prison but died a free man aged 86 in 1993. For copyright reasons I cannot show his picture. But if you google Lowell Birrell you can see his image.

So, the sequence was:

US Leather→Central Leather→US Leather→Keta Gas & Oil→Swan-Finch Oil
1893 1909 1927 1952 1955

Swan-Finch is still in business.



#12. B.F. Goodrich Co. One share of Common Stock, to Ada Blye dated December 1934. Note number matrix right. Hole and punch cancelled 10 15 71. Founded 1912 registered in State of New York.

#1937

Note Company #11 was left out; this was GE, dealt with in the last chapter.



**Vignette of BF Goodrich Co.** 

The vignette shows a laureate man on the left holding a trumpet and a sword. A Corinthian helmet sits behind him. The laureate female on the right holds a laurel wreath and a palm across her lap, both for victory. Fame, a female goddess is supposed to be holding the trumpet announcing the greatness of Goodrich! The designer mixed up the attributes!

Benjamin Franklin Goodrich (1841-1888) was born in Ripley, NY, orphaned at the age of eight, and brought up by his uncle. He went to what is now Case Western Medical School to become a physician. In 1863 he became a surgeon during the civil war on the Union side.

After he returned from the war, he went into the real estate business with his brother-in-law Harvey Tew. They ended owning the Hudson River Rubber Company in 1869. They founded the Goodrich and Tew Company in 1870. Town leaders in Akron, Ohio heard of this and came to inspect the facility, and offered him \$13,600 to move his operation to Akron. Tew stayed at home but Goodrich opened the Akron Rubber Works in 1871. He became B.F. Goodrich Company, the first rubber company west of the Appalachians. Later Akron would become the rubber capital of the US. And in time Goodrich became one of the big four – BF Goodrich, Firestone, Uniroyal, and Goodyear.

In 1839 Charles Goodyear had already discovered that adding sulfur to rubber (vulcanization) stopped it cracking in cold weather and getting soft and tacky in the hot weather. Goodrich's first product was rubberized fire hose. Previously fire hose was made from leather, which often burst under high pressure especially in wintry weather. Goodrich also produced drive belts for factory steam engines, like auto fan belts today. Rubberized fire hose and drive belts both replaced leather ones. Benjamin died in 1888 and his son took over. By 1892 sales were \$1.4 million. In 1895 his son started the first corporate rubber research lab, and the next year made the first US pneumatic bicycle tires.

The same year, Alexander Winton, turned from bicycle production to automobile production. He asked Goodrich to make tires for him. Winton's 1899 Stanhope had a single bench seat, a folding cloth top, and tiller steering.

# DISPENSE WITH A HORSE



and save the expense, care and anxiety of keeping it. To run a motor carriage costs about ½ cent a mile.

## THE WINTON MOTOR CARRIAGE

is the best vehicle of its kind that is made. It is handsomely, strongly and yet lightly constructed and elegantly finished. Easilymanaged. Speed from 3 to 20 miles an hour. The hydrocar-

bon motor is simple and powerful. No odor, no vibration. Suspension Wire Wheels. Pneumatic Tires. Ball Bearings. Send for Catalogue.

THE WINTON MOTOR CARRIAGE CO., Cleveland, Ohio. 1898 Winton Stanhope with pneumatic BF Goodrich tires.



Dealer in Salt Lake City 1913 decorating his car advertising Goodrich tires.



Elegant advertisement for Goodrich Silvertown Tires in 1920.

Winton stopped auto production in 1924. He went on to develop diesel engines that would power diesel locomotives and submarines and sold out to GM in 1930. Goodrich had already made tires for carriages and expanded into automobiles early. In 1900 his research lab discovered how to de-vulcanize rubber to reclaim the rubber, so now they could recycle tires.

In 1910 Goodrich was making footwear, balls for sport and waterproof clothing. He also made the first cord tire for autos. By 1911 sales were \$27 million. In 1912 they reincorporated in New York (see the seal on the certificate). Four years later they joined the DJIA 20 where they stayed till 1923, then briefly again from 1928 to 1930. A big competitor, US Rubber (dealt with in the last chapter), was in the DJIA from 1899 to 1927. Good<u>year</u> Tire and Rubber (different from Good<u>rich</u>) was in the DJIA from 1930 to 2000.

In 1926 a Goodrich scientist invented PVC. Eleven years later another Goodrich scientist invented synthetic rubber. During the Second World War (1939-1945), Japan blocked US access to rubber. In 1940 Goodrich started making Ameripol (American Polymer) from petroleum derived butadiene. Ameripol tires were more expensive but lasted longer. By the end of the war Goodrich produced 165,000 tons a year of synthetic rubber, the most in the world. In 1943 Goodrich Chemical Company, making chemicals and plastics, became a subsidiary of B. F. Goodrich.

After the war in 1946 Goodyear bought a Troy, OH, plant and started selling aircraft tires, brakes and landing gear. The next year they developed a tubeless puncture-sealing tire. By 1955 tubeless tires became the industry standard. By

flooring and industrial, and sponge rubber goods. Ten years later Goodrich invented the radial tire that increased tire life by 50%. Again, this became the standard.



Making Ameripol during the war in 1939.

By 1966 sales were \$1 billion. Profits in 1967 were around \$50 million. But the Rubber Workers Union struck several times crippling Goodrich, Firestone and Uniroyal. Within a few years, strikes by the Teamsters and Autoworkers Unions also decreased demand for US tires. Goodrich wanted out. Profits in 1971 were only \$1.7 million. The next year they closed many of their tire facilities and concentrated instead on chemicals and plastics.

In 1986 Goodrich merged their tire business with Uniroyal to form Uniroyal-Goodrich Tire Co., which Michelin bought two years later. The same year Goodrich bought Tramco, a maintenance and repair company for commercial aircraft. Goodrich concentrated on chemicals and aerospace which were much more profitable. In 1999 they bought Coltec, a machining company, for \$2.2 billion and became the leading maker of aircraft landing gear. Two years later, they left specialty chemicals altogether and renamed themselves Goodrich Corporation. United Technologies bought them out in 2011 by for \$18 billion - the end of an era.

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#13. Republic Iron and Steel Company Specimen Stock Certificate for one hundred shares of common stock. Undated, but it was before 1929. Serial number 00000, unsigned. Hole and stamp cancelled with SPECIMEN.



Vignette showing laureate seated man with cogwheel, hammer calipers, anvil, chain, and pliers. Behind is a blacksmiths fire.

The Republic Iron and Steel Company started in 1899 capitalized at \$55 million. They owned 36 bar-forged iron plants, five blast furnaces and many mines, mostly in central and southern states. They made bar iron, pig iron, steel, nuts and bolts, washers, rivets, nails, railroad spikes and axles and shafts to transmit power from motors. Their offices were in Chicago.

In 1905 they moved their offices to Pittsburgh, and in 1911 to Youngstown, Ohio. In Youngstown they employed 20,000 people, after profits of \$2.4 million the previous year. During the First World War (1914-1918) they bought the Bessemer Coal and Coke Company of Alabama who produced millions of tons of coke. In 1920 profits peaked at \$7.6 million then slumped as demand for steel fell after the war.



Left: Youngstown works, the blooming mill and engines. Right: bosses in 1915, from left to right: RAC Smith, VA Topping, FB Dalzell, TE Isurton.

In 1927 they cultivated steel pipe production. Cyrus S. Eaton (1883-1970), a

Midwest Canadian-American financier, then bought controlling stock in the company and ran it. He merged it with Central Alloy Steel Corporation and others in 1929 to form a new corporation – the Republic Steel Corporation. The specimen stock certificate shown is of the Republic Iron and Steel Company, not Republican Steel Corp., so must have been before 1929.

Eaton amassed a fortune of \$100 million in 1929 most of which he lost in the Great Depression, but rebuilt his fortunes in the 1940s and the 1950s. He was passionate about peace and sponsored the Pugwash Conferences, to discuss nuclear power and the cold war and seek a rapprochement with Russia. Pugwash was Eaton's birthplace in Nova Scotia.



Cyrus Eaton, American-Canadian Financier, started Republic Steel 1927-9.

In the 1930s Republic Steel was the third largest US Steel Corporation after US Steel and Bethlehem Steel. In 1934 Eaton acquired Truscon Steel Company that made pressed steel for autos and white goods (fridges, washing machines, etc.). The DOJ fought this merger saying it gave Republic an unfair advantage, but acquiesced the next year. During the Great Depression, Republic was able to buy up several smaller steel companies that had failed.

In 1936 Eaton moved Republic's offices to Cleveland, Ohio, close to the Great Lakes to service the auto industry growing in Detroit. They issued a \$25 million bond to build a new continuous strip mill in 1937 in Cleveland. It could make steel sheets up to 92" wide and produced 840,000 tons a year, the largest continuous strip mill in the world.



Republic Steel Mill worker housing with outhouses Birmingham, AL. 1936

In 1935 the CIO (Congress of Industrial Organizations), a federation of industrial unions, was born. This union had a new technique. Instead of just picket lines to taunt scabs they organized sit-down strikes. This meant strikers sat down where they worked. Owners were reluctant to use private security to force out sit-down strikers because they might destroy plant property. So, this made it difficult for management to bring in outside labor ("scabs"). Friends even dropped strikers food and water by airplane, so they could stay for days.

The 1937 strike was large and lingering. The Ohio Governor eventually sent in troops to disperse the sit-in strikers. On Memorial Day 1937 Chicago police fired into a group of unarmed protesters killing ten men. Newsreels aired the violence across the nation. They called it the Memorial Day Massacre (picture opposite). The CIO was about political power first and grievances second.

The Second World War (1939-1945) stretched steel makers to the limit. In order to secure lucrative government contracts, steel mill owners had to let unions back in and accede to union demands. The government would not contract with non-union labor. In 1940 Republic made six million tons of steel. By 1942 Republic became the largest US electric furnace steel producer. By the end of the war Republic was capitalized at \$140 million. Like so many other companies they had suffered through the ups and downs of the wartime demands, and of the Great Depression.

Republic continued to expand after the war. They thought farm machinery would be the next big creator of demand. But it was not. The Korean War (1950-1953) was. Republic spent \$75 million modernizing its Cleveland plant

and also started making titanium steel. But profits dwindled. In 1959 Republic opened a research center and spent another \$1.2 billion in the 1960s modernizing.



1937 Memorial Day Massacre Chicago.

The Great Lakes, and especially Detroit, were its biggest market in the 1960s. And by 1969 they were back to their number three position behind US Steel and Bethlehem Steel. But in the 1970s slice and dice fever took hold. They "restructured and diversified". That was business-speak for selling off declining businesses and acquiring other businesses like insurance, shipping, aviation and petroleum. Because of foreign competition, they fell to fifth place among US Steel makers in 1984, making only 7% of US steel. They merged with Jones and Laughlin Steel to form the LTV Steel division of the LTV Corporation.

In 2005 CH Industries, a Mexican steel producer bought them out. By 2014 CH Industries were producing six million tons of steel a year.

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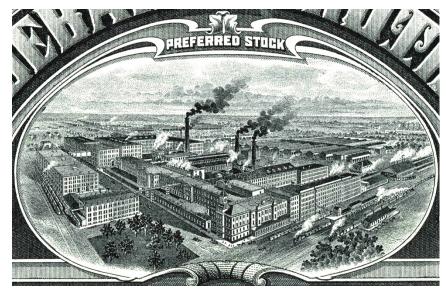
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#14. Studebaker Brothers Manufacturing Company. Unissued, unsigned, and hole cancelled, preferred stock certificate dated 1906.

Certificate says the company was incorporated in Indiana in 1868. Printed by Western Bank Note Company of Chicago using the "steelograph" process invented by Homer Lee (1855-1923) a painter and engraver who owned an engraving company. He invented a steel plate printing system with various improvements called "steelograph".

#1934



Vignette of Studebaker factory.

In 1736 a family named Stutenbecker emigrated from Solingen, in what is now Germany. They came from a long line of blacksmiths. The receiving agent in colonial America Anglicized their name to Studebaker. The family settled in Hagerstown, MD. One of the family, Clement, built his first Conestoga wagon in 1750. The family later also built Prairie Schooners. Wagon making required both woodwork and blacksmithing skills. Oxen pulled Conestoga wagons that could carry three times the weight that prairie schooners could carry. Westward migrants preferred the lighter prairie schooners to Conestoga wagons.



From left to right: Peter and Jacob standing, Clem, Henry and John sitting.



Conestoga Wagon, note bowed floor and oblique overhanging ends.



Prairie Schooner. Note flat floor, shallower box, less overhang of ends.

It was Clement's great-grandsons who opened a blacksmith shop manufacturing wagons in South Bend, Indiana, in 1852. There were five brothers born between 1826 and 1844, and also five sisters. The first sons Clement and Henry were

blacksmiths. The third son John made wheelbarrows and gold mining tools in Placerville, CA. This was located just nine miles from Sutter's mill where James Marshall had discovered gold in 1848!

John saved \$8,000 by 1858. Average hourly wages in 1858 were 8¢, now they are \$15, so today that would be worth over \$1 million. He moved back to South Bend and bought out Henry's share of the wagon business. They already had an army contract to build wagons and Henry was religious wanting nothing to do with the army. That left John and Clement in charge of the business. At the height of westward migration one half of all prairie schooners were Studebakers.

The Civil War (1861-1865) enhanced business further. By 1868 sales were \$350,000 a year. The fourth son, Peter, had a general store in Goshen, Indiana, which he expanded to a wagon distribution center. In 1868 Clement, John and Peter formed the Studebaker Brothers Manufacturing Company (see the stock certificate). It had a spur line on the Lake Shore Railroad connecting with the Union Pacific. So, they transported most of their wagons by rail or steamship. They then brought in their youngest brother Jacob to make sulkies and landaus.

In 1889 President Harrison ordered a full set of Studebaker carriages for the White House. By 1900 the Studebaker site extended over 100 acres. The four brothers' sons and one son-in-law then took over. In 1895 Fred Fish (John's son-in-law) pushed auto manufacturing and hired an engineer to design one. They opted at first for electric autos that they made from 1902 to 1911.



1908 Studebaker Garford B limousine, note chauffeur position outside.

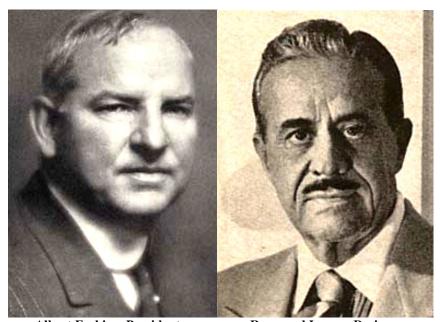
In 1904 they also brought out their own gasoline auto. At the same time, they made bodies for other engine manufacturers. One engine manufacturer, Garford

initially cooperated but, against the terms of his contract, he started competing with the Studebakers. So, the Studebakers dropped him in 1911.

Another engine manufacturer was EMF (Everitt, Metzger and Flanders), renowned for their unreliability! In 1911 Studebaker refinanced and incorporated as Studebaker Corporation. They took over EMF and paid \$1 million to fix problems for all EMF auto owners. For two years they sold the EMF 30, Flanders 20 and Studebaker Garford 40.

Then in 1913 they started their own marque. They called all their autos Studebaker, which had an in-line 6 Monobloc engine casting. They appointed Albert Erskine (1871-1933) President in 1915. Three famous engineers, Fred Zelder, Owen Skelton and Carl Breer worked for Studebaker. They called them the "Three Musketeers". They helped Studebaker launch more successful autos in 1918. Unfortunately, they left in 1920 to form a consultancy, which eventually became Chrysler. The replacement engineer was Guy Henry, who introduced molybdenum steel.

Studebaker was then the third largest manufacturer of autos after Ford and Overland. Business prospered during the First World War (1914-1918). They sent thousands of wagons, autos and ambulances to England, France and Russia. By 1918 their seven plants were making 100,000 autos and 75,000 horse-drawn carriages a year. They felt small farmers often could not afford autos hence the parallel production. In the prior seven years they had sold 467,000 carriages and 277,000 autos. But they realized the trend towards autos, so in 1920 switched their carriage division to trucks, buses and fire engines.



Albert Erskine, President.

Raymond Loewy, Designer.

In 1910 there were half a million cars on the road in the US. By 1927 there were 20 million. Those were times of rapid expansion for automakers. In 1926 Studebaker made the "Erskine Six", a new small car, named after the President of the company. In 1928 they took over the ailing Pierce-Arrow Motor Company of Buffalo, NY. By 1929 they made 50 models. Business was great. They had 225 acres of plants making 180,000 autos a year with 23,000 employees. Plants were in South Bend, Detroit and Ontario. The Ontario plant was just an assembly plant, which could claim autos were British built, thus reducing tariffs. Canada became a self-governing dominion of the British Empire in 1867. In 1931 England acknowledged Canada as a co-equal country.

When the Great Depression hit, the previously successful Studebaker under Erskine was unprepared. Erskine made a disastrous decision in 1930 to declare a \$7.8 million dividend, which was five times the net profit that year! The next year he paid another dividend of \$3.5 million also out of capital. What was he thinking? Working capital had been \$26 million in 1926. By 1932 it had dwindled to \$3.2 million. On top of that, they owed the banks \$6 million. Studebaker defaulted and went into receivership in 1933. Erskine, already diabetic and suffering from heart disease, shot himself.

But by December 1933 Studebaker was making money again. In 1937 they introduced overdrive and hill holding. In 1939 a new model, the Champion, appeared which was a smash hit. Sales doubled. Raymond Loewy (1893-1986) was a French born industrial designer working for Studebaker who created such iconic models over 30 years.

During the Second World War (1939-1945) Studebaker made the US6 truck and M29 Weasel cargo and personnel carrier. After the war they advertised "First by far with a post-war car", and introduced the 1947 Starlight coupe. This started the fashion for a flat topped rather than sloped trunk as well as the rear wrap around window rather than the earlier tiny rear windows.



1947 Studebaker Starlight Coupe.

In 1949 new, more cautious executives could not compete with GM, Ford and Chrysler. Studebaker never took a strike – preferring instead to negotiate and

accede to Union demands rather than closing down – all the other companies took strikes. Hence Studebaker paid their workers the highest in the industry making them uncompetitive. In 1950 Packard bought out Studebaker. After the purchase, Packard found that Studebaker's break-even point was 50,000 autos, more than they had made even in their top sales years!

Studebaker marketing directors had also planned poorly, building more sedans when the public wanted more Starlights in 1953. Studebaker-Packard hobbled along making autos for another eight years. But they were no match for GM, Ford and Chrysler's new generation of finance, engineering and marketing experts and their huge assets. Their ruinous employee policies did not change.



Studebaker Champion starlight coupe 1954.



New compact car - Studebaker Lark VIII 1960.

In 1959 they brought out a new very popular compact called the Lark. The other big three auto companies immediately followed with compacts in 1960, which outstripped the Lark. Studebaker followed with the Gran Turismo Hawk in 1962, and finally the avant-garde Avanti in 1962. These were all great styling innovations. But it was their last gasp.



Studebaker Gran Turismo Hawk started in 1962.



1963 Studebaker Avanti in gold. It had a Fiberglass body.

Despite their liberal employee policies, a United Auto Workers strike for 38 days in 1962 finished them off. In 1963 they had to close their South Bend plant. Interestingly, nearly 25% of the workers were African American, which was a great blow to their community. The Hamilton Ontario plant closed in 1966. Wagner Electric then Worthing Corporation took over what was left of Studebaker in 1967. After Studebaker folded another company called Avanti

Motor Company opened to re-manufacture Avantis using fiberglass bodies and a GM or Ford chassis, called Avanti II. Few were made, and they closed in 2006 – a brief ghostly appearance from a once mighty company.



Rear of Avanti way ahead of its time in styling in 1962.

The Studebaker Drivers Club still has 12,000 members around the world today. There is also an Antique Studebaker Club and an Avanti Owners Association International with 2,000 members. We now think of Studebaker as an auto company. But from 1852 to 1920 (68 years) they were number one in the country making horse-drawn carriages. They made automobiles from 1904 to 1963 (59 years). Studebaker was in the DJIA 20 from 1916 to 1924.

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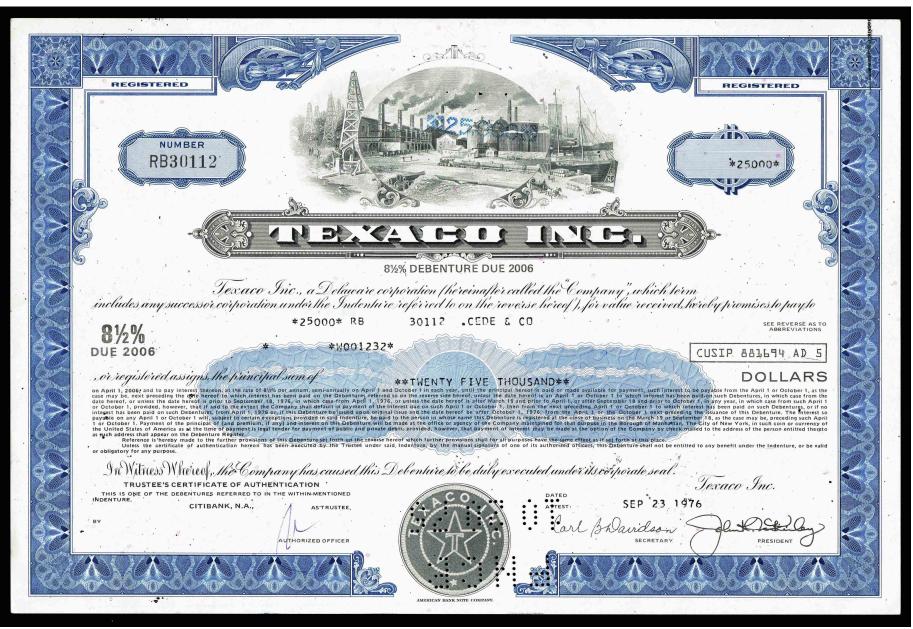
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#15. 30 year 8½% \$25,000 bond certificate issued to Cede & Co. dated September 1976. Punch cancelled NCP. 10 20 75.



Vignette showing oil fields left, early refinery center, and shipping right.

The first commercial US oil well was in Titusville, Pennsylvania in 1859. Pennsylvania then became the center of oil production. In 1901 a huge well, the Spindletop Gusher, near Beaumont, Texas was discovered. This dwarfed 19<sup>th</sup> century Pennsylvania oil production (35,000 bbl./day) yielding 100,000 bbl/day.



Western PA Oil Co. 1865 stock certificate. Note oil field vignette.

Enter Joseph Cullinan (1860-1937)! He had worked as a manager for the Standard Oil Company in Pennsylvania. In 1895 he left and started his own business manufacturing steel storage tanks in New Castle, PA.

Meanwhile, a water company accidentally struck oil instead of water in Corsicana, Texas in 1894. The mayor asked Cullinan down to advise him. Cullinan took such an interest that he developed the state's first petroleum conservation statute. He also set up a refinery in Corsicana.



Vignette detail of 1865 stock certificate showing how oil fields ran in 1865.

Just then oil was discovered at Spindletop. Cullinan was in the right place at the right time. He had extensive managerial experience in the oil business. He formed the Texas Fuel Company capitalized at \$50,000 in 1901 in Beaumont.



Joseph S. Cullinan.

In 1903 Cullinan got a financier in New York City named Arnold Schlaet to bring in more investors. They bought up his Texas Fuel Company and capitalized a new company called the Texas Company at \$3 million. Texas Co. bought rail cars and barges, drilled for oil and built refineries. They established markets in Antwerp for the Low Countries, and in 1905 in Panama.

Spindletop was only a mile from the salt water Neches River inlet. Salt water leaked into Spindletop in 1902 ruining many of the companies based there. Fortunately, the next year Texas Company bought the Sour Lake Oil Field a few miles away. And in 1905 they bought the Humble Oilfield. These were both outside Houston. In 1905 they completed a 90-mile pipeline to Port Arthur and built refineries there too, as well as an asphalt facility. Barges ran to Louisiana where sugar planters used the oil to heat their boilers to refine sugar cane. They refined oil mainly to kerosene used for heat and for light. In 1905 there were only 78,800 automobiles on the road, which was still a minor market.

By 1908 Texas Company were selling oil (in barrels) in all states except five in the west. They had offices in New York City and their telegraph address was "Texaco". In 1903 a 19-year-old Port Arthur Italian refinery worker suggested the lone star logo in red. He added the green T in 1909 to match the colors of the Italian flag. Texas Company registered the logos around 1906 to 1909.



Texas Company Gas Station probably around 1913. Note logo.

In 1913 Texas Company first used TEXACO on their logo (see above). In 1914 for the first time, gasoline production outpaced kerosene with the advance of automobiles. That year 1,763,018 vehicles were registered in the US. By 1920 it was ten million and by 1925 twenty million.

In 1911 the Supreme Court ordered Standard Oil Company of New Jersey to break-up into 34 companies. John Rockefeller had horizontally and vertically integrated his Ohio Company and formed a trust. A trust was a financial innovation designed to evade the Sherman Antitrust law of 1890. Rockefeller retired in 1897 but owned lots of company stock. The fate of the main five corporations emerging from this trust, like the Baby Bells from Ma Bell, were:

**Std Oil of NJ** (Jersey Standard) -> Eastern States Standard Oil (ESSO) -> Exxon **Std Oil of NY** (SOCONY) -> Mobil, later merged with Exxon -> **ExxonMobil** 

**Std Oil Co** (Sohio) -> became subsidiary of British Petroleum (BP)

Std Oil of Indiana -> American Oil Co (AMOCO)

Std Oil of Calif (SOCAL) -> ChevronTexaco -> Chevron



Standard Oil Co stock certificate 1875 signed by Rockefeller and Flagler.

There were many other spin offs e.g. Standard Oil of Kentucky merged with Chevron. Another was Standard Oil Atlantic who merged with Richfield to become ARCO, later acquired by BP abroad and Sun Oil Co (SUNOCO) in US. Paradoxically, Rockefeller, the first billionaire in US history, became even richer than he was before after the break-up of his trust!

In 1911 Texas Company built their first curbside pump with an underground tank. The First World War (1914-1918) was good for business - the Texas Company quadrupled their assets between 1914 and 1920. In 1920 two Texas Company researchers in Port Arthur developed the Holmes-Manley process. Yes, you guessed their names! This was the first continuous refining process for crude oil. It was quicker, and it could get more gasoline per barrel of oil than previously. In 1926 the Texas Company reincorporated in Delaware where there were less legal restrictions than Texas.

By the late 1920s Texas Company had refineries all over the US, as well as in France, Belgium and Canada. They were the first US oil company to sell gasoline nationwide. By 1928 they had over 4,000 gas stations in all states.

The depression was bad for business. But in 1931, Texas Co. bought the Indian Oil Company of Illinois, owners of Havoline oil, which they promoted heavily. In 1932 they also introduced "Fire Chief" super octane gasoline for fire engines. They joint ventured with Standard Oil of California (SOCAL, later Chevron) under the name Caltex (California and Texas) in 1936. They would later drill in the Middle East and in Indonesia. They also bought Barco Oil in Columbia.

A word about octane numbers. Octane is one product of petroleum refining. Early on in gasoline refining it was found that some gasoline detonated more easily than others when compressed. Petrol engines work by compressing then igniting vaporized gas and air. If the gasoline detonates prematurely while being compressed it causes a knocking or pinging sound from the engine that can damage the engine. The higher the compression ratio (volume ratio of gas between the piston being at the bottom and the top of the cylinder), the greater the risk of knocking. You can overcome this by using more octane.

Actually, no gasoline is pure octane. Octane ratings simply represent the equivalent mix of chemicals in the gasoline that have the same risk of premature detonation as the percentage octane in an octane/ heptane mix.

Super premium gas of 100 octane is used for super high compression racing cars, and for piston—powered aircraft engines, which they call, called avgas. Jet fuel is different - it is closer to kerosene than gasoline.

During the Second World War (1939-1945) Texas Company's CEO Torkild Rieber was a Nazi sympathizer. He cabled Berlin with information about which ships were sailing to England and what their cargoes were. He supplied oil to another fascist, Franco, during the Spanish Civil War (1936-1939). Texas Co. forced Rieber to resign in 1940. Harold Ickes, the Federal Petroleum Administrator during the war, sponsored two pipelines from Texas to the East coast, to avoid tanker and oil loss from German U-boats.

After the war, for the first time oil consumption exceeded production in 1947. Texas Company therefore partnered with three other US oil companies and Saudi Arabia to build a pipeline from Saudi to the eastern Mediterranean.

In 1959 the Texas Company changed its name to Texaco. Seven years later they changed their traditional "banjo" sign to a hexagon (see pictures opposite).

From 1965 to 1993 Texaco was part of a consortium that developed the Lago Agrio oil field in Ecuador. This caused major pollution. Chevron (who would later own Texaco) said they were unfairly targeted when Ecuador's national oil company, PetroEcuador, should have shouldered more responsibility.

In 1984 Texaco bought Getty Oil for \$10 billion thereby doubling its reserves. But the next year Pennzoil won a \$10.53 billion verdict against Texaco (then the largest US civil verdict) because Pennzoil had already contracted to buy Getty Oil before Texaco signed another contract. Texaco later filed for bankruptcy (again the largest at the time) and restructured to protect its assets and shareholders. Pennzoil ended up with only \$3 billion.

In 1989 Texaco joint ventured with Aramco (Arabian American Company) for 20 years for US's east and Gulf States. Aramco owned 50% of Texaco in US's eastern and gulf states. They called this joint venture Star Enterprise. Texaco also sold Texaco Canada to Imperial Oil who re-branded all the pumps as ESSO (Eastern States Standard Oil). In December 2019 Saudi Arabia (raising money to diversify their economy) announced the sale of 1.5% of Aramco valuing the company at \$1.7 trillion. The IPO realized \$26 billion, far short of Prince Mohamed bin Salman's desired \$100 billion.



Left "banjo" sign. Right hexagon sign, which replaced the banjo in 1962.

In 1996 Texaco paid \$170 million to settle a racial discrimination suit from African American employees, causing a lot of ill will.

And now for more corporate alphabet soup slicing and dicing! In 1999 Texaco joint ventured again with Shell Oil as Equilon in US's West and Midwest states. This led to an antitrust suit in 2006 which ultimately cleared Texaco and Shell. In 2002 Chevron merged with Texaco to become ChevronTexaco, and Shell bought out Texaco's part of Equilon. Later ChevronTexaco became Chevron.

Texaco sponsored motor sports to promote Havoline motor oil and gasoline. It also sponsored the Metropolitan Opera for 63 years and various radio shows.

Stan Ovshinsky, who founded Ovonics Co., invented Nickel Metal Hydride (NiMH) batteries used in modern hybrid and electric vehicles. GM controlled Ovonics in 1994, then Texaco in 2002. Ovonics later restructured as Cobasys in a joint venture between Ovonics and Chevron in 2003 - an obvious conflict of interest. Ovonics' batteries, after all, competed with gas autos!

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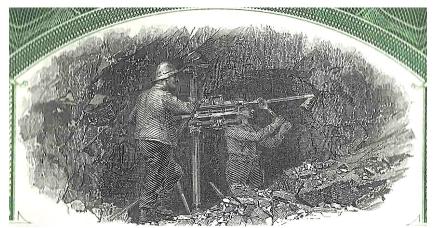
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#18. Utah Copper Stock Certificate for 100 shares. Unissued, undated but hand-signed. Incorporated in New Jersey.

Note that #16. US Rubber, and #17. US Steel have already been dealt with in the last chapter.



Stock vignette of drilling to place explosives in mine (it should be an open pit!)

In July 1847, Brigham Young led 143 Mormon men, three women and two children for three months from Nauvoo, Illinois on the California trail, finally entering Salt Lake Valley. Further waves continued along the trail to the valley until the transcontinental railroad connected at Promontory, Utah in 1869.

The Mormons journeyed to Salt Lake City because they were being attacked in Illinois and Ohio, where they had settled under their founder, Joseph Smith.



Obsolete banknote signed by Joseph Smith, founder of the Mormons.

Two sons of a September 1847 pioneer by the name of Bingham used to graze their cattle in an area south of what is now Salt Lake City. They noticed copper ore deposits in the canyon and told Brigham Young about it. Brigham told them they needed all hands to grow crops for the future immigrants. In 1850 the Bingham brothers settled there hence the name Bingham Canyon.

In 1863 some miners started extracting placer gold, lead, silver, and copper deposits in the area. Around 1895 Bingham Canyon owner, Enos Wall, asked a mining engineer to do a feasibility study of the mine. The mining engineer was Daniel Jackling (1869-1959). Born in Missouri, he was orphaned aged two, and

brought up by one family member after another. Eventually he became a mining engineer. He worked at Cripple Creek as a miner then as a metallurgist. In 1896 he developed a cyanide process to extract gold ore. He also worked in Washington State and elsewhere in Colorado.



**Daniel Jackling (1869-1959)** 

Jackling suggested open pit mining with steam shovels to load the low-grade ore (2% copper) onto railroad cars brought right up to the mine head. Rail would take the ore to a mill where Jackling had invented a process to extract copper sulfide containing 30% copper.



Map of Bingham Canyon, Coppertown, Magna and Garfield in Utah.

Three companies started in the area:

- 1. Utah Consolidated Gold Mine Ltd. (English investors)
- 2. Boston Consolidated Gold & Copper Co. Ltd. 1898 (English investors)
- 3. Utah Copper Company for low grade copper ore from the Bingham canyon 1903 (Enos Wall, local owner)

Daniel Jackling and Enos Wall organized the Utah Copper Company in 1903 and started open pit mining in 1906. In the 1920s they opened a model village, Coppertown, for employees 17 miles southwest of Salt Lake City (see map).

In an open pit mine they drilled the rock both vertically and horizontally, then tamped in dynamite and exploded it. They brought a rail track into the mine head, by a special car that moved the track sideways for each new release of ore. Giant steam shovels loaded the ore into 100-ton railcars.

Next they took the ore to a mill; which Utah Copper had built at Magna Mill. There they ground the ore. Finally, they rotated the ore in huge steel drums with steel balls the size of tennis balls to powder it. Jackling invented the next step: they mixed the powder with water and chemicals to create froth on top. The copper sulfide stuck to the bubbles at the top. They called this water flotation separation. The froth was drawn off the top. They disposed of the slag underneath. They then filtered the froth by sucking it through canvas. Air was then blown through the canvas to unstick the cakes of copper sulfide, which now contained 30% copper.



Bingham Canyon, now called Kennecott Canyon in 2003.

They then shipped the copper sulfide by rail to the smelter and refinery which Utah Copper had built at Garfield (see map) about 200 miles south. They added ores containing iron, silica and sulfur to facilitate faster heating of the copper sulfide in a "roaster". This converted the copper sulfide to copper oxide. The sulfur, burnt off as sulfur dioxide, caused local farmers in 1904 to sue because

the sulfur dioxide destroyed their crops. So, they closed the smelter and moved it. Today, instead, they convert the sulfur dioxide to valuable sulfuric acid. The next smelting process was to put the mixture into a 2,800°F furnace where the copper melted with a mixture of iron, silica and lime to form copper "matte". They dumped the slag with iron in a huge pond.

Next came the refining process. They took the copper matte to a converter to refine it. Air was blown into a furnace containing the impure copper to burn off impurities. They poured the copper, now 98-99% pure, into ingots for shipping. Later they extracted the impurities producing silver, gold and molybdenum.

By 1912 the Bingham open pit mine and the nearby American Smelting and Refining Company (ASARCO) refinery in Garfield in southern Utah, were the largest industrial mining complex in the world. In 1910 Utah Copper merged with the Boston Consolidated Gold and Copper Company Ltd. In 1915 the Kennecott Copper Corporation bought 25% of the stock of Utah Copper, and by 1923 owned 75% of the stock. In 1936 Utah Copper became the Kennecott Copper Corporation. The Guggenheims were the chief investors in the Kennecott Corporation, which also owned mines in Chile, and in Alaska. By the 1960s they employed 7,000 people. Because of the steep walls of the open mine, they installed an interferometric radar system. This warned the mine owners the day before a massive landslide, the largest non-volcanic landslide in US history. No one was killed.

As yields slowed corporate slice-and-dice alphabet soup took over. They were bought by SOHIO (Standard Ohio) then by BP Mineral Assets in 1987, then by Rio Tinto in 1989 who made the subsidiary the Kennecott Utah Corporation (KUC). By 1990 KUC only employed 2,000 people.

The Bingham mine makes 300,000 tons of copper, 400,000 ounces of gold, 4 million ounces of silver, 10,000 tons of molybdenum and one million tons of sulfuric acid a year. Over their lifetime they have yielded more silver and gold than the California gold rush, the Klondike gold rush, and the Comstock silver lode combined!

The Bingham/Kennecott pit was due to expire in 2019. Rio Tinto now own the mine and will put \$1.5 billion into it to extend the life to 2032. After closing for a couple of years the mine reopened as a tourist attraction in 2019, and I have visited the mine. KUC had already spent over \$450 million on cleaning up lead, arsenic and mercury pollution to avoid being labeled a superfund site. Now Rio Tinto face suits from the EPA, from the US Department of Interior Fish and Wildlife and the State of Utah over a huge tailings pond in Magna. Future suits could even include patients with lung damage from exposure to air particulates from the Magna mills.

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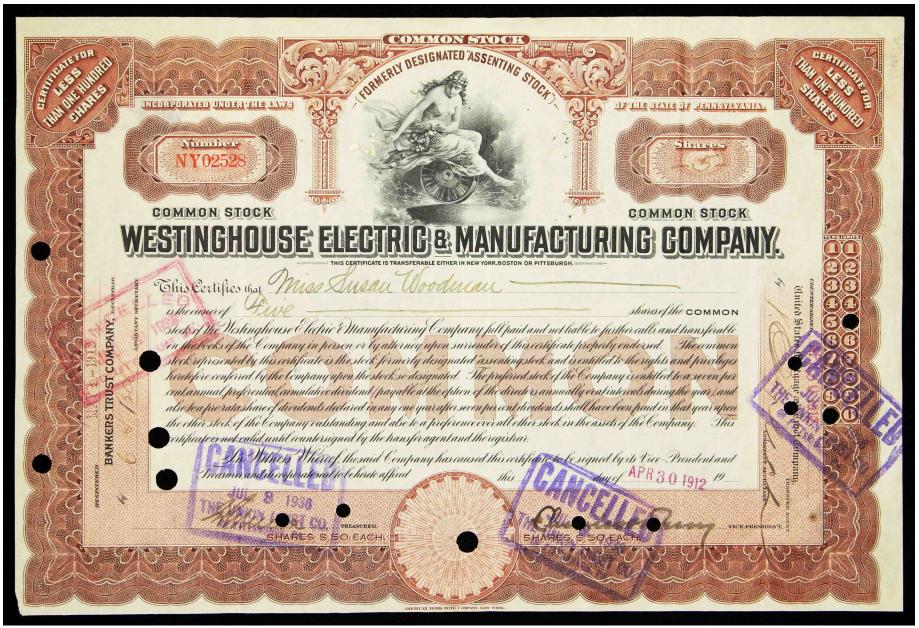
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#19. Westinghouse Electric and Manufacturing Company 5 shares of common stock initially issued at \$50 each to Miss Susan Woodman dated April 1912. Note share number matrix on right side. Hole and stamp cancelled in 1936 after she died. The company was registered in the State of Pennsylvania. \$250 does not sound like much but GDP per person in 1912 was \$396.

#20 stock in 1916 DJIA 20 was Western Union, already dealt with.



Vignette of Allegory of Electricity, riding on a wheel, scattering flowers and fruit as she speeds. Possibly it represents her floating above a generator making electricity and good for the world.

Every American schoolchild knows that Thomas Edison (1847-1931) is the greatest American inventor. But another man, George Westinghouse (1846-1914), also deserves careful consideration. Westinghouse employed 50,000 people by 1900 in his more than 60 companies and had 361 patents to his name. He was a pioneer in human resources too. His factories were the first to start a nine-hour day and the first to give Saturday afternoons off. He was careful to provide for his employees, giving them accident insurance, home insurance, low cost home ownership and free medical care at work, all at his own cost. Work safety was another of his obsessions.

Westinghouse's father manufactured agricultural equipment and small steam engines in a large shop. George loved to work in his father's shop but disliked school. In 1860 his father paid him 50¢ a day to work in his shop. Aged 17 George enrolled in the Union cavalry in the American Civil War, but was seconded to the navy as a mechanical officer. After the Civil War he enrolled at Union College as a classicist. Wrong choice! He left within a couple of months. Aged 19 he got a patent for a rotating steam engine he had been working on for a few years. Later his steam turbine would be the successful conclusion of this invention.

He moved to Pittsburgh and by chance met Ralph Bagley, who owned a foundry, and got him to invest in his inventions. In the 1860s when a train wanted to stop the engineer shut off the valves to the locomotive, and whistled to the brakemen (one to a car, and sometimes one for a whole train). The brakemen turned a wheel to clamp on the wheels of carriages. Then they dashed to the next car often overhead along a catwalk to do the same for the next car. It was very dangerous work. It could take two miles for the train to stop!



George Westinghouse 1846 – 1914.

George Westinghouse invented air brakes, so the engineer could brake the train alone from his locomotive in a much shorter distance. The first air brake trial in 1868 markedly reduced deaths from train crashes. Soon thereafter passenger trains were fitted with them because passengers worried about accidents. But cargo trains delayed because of the expense. Congress finally passed legislation that all trains should have air brakes.

When George was 20, he met a beautiful young lady in a railway carriage named Marguerite. She was 24. At once, he got letters of recommendation from whoever he could find to tell her what a good fellow he was. Within a year they married. They must have had low fertility because it took 16 years to get pregnant. They built a house called *Solitude* in Pittsburgh.

He was a very humble man and enjoyed socializing with his employees. During his life he never had a strike at any of his many factories. This was exceedingly unusual for the era. He invented air brakes for the railroads (still used today on railroads as well as on trucks). Before his invention, 5,000 brakemen died every year from accidents. Countless others died from railroad accidents and as a result it was not uncommon to have a phobia about railroad travel at the time (Charles Dickens had a railroad travel phobia).

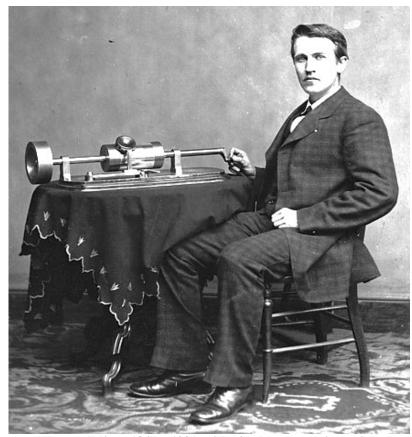
Westinghouse's greatest service to mankind was developing an electrical transmission system using AC rather than DC. Edison favored DC. Historians have called the titanic struggle between the two the "war of the currents". Westinghouse also developed natural gas distribution, improved railroad signal systems so they were much less accident prone, hydroelectric power, and turbine engines.

Every schoolchild knows that Edison invented electric lighting. Not so! Sir Humphry Davy invented the carbon arc (called the Electric Arc Lamp) in 1802. Factories used it extensively for lighting but because it was exposed it often caused fires. Several inventors made electric light bulbs before Edison. De la Rue and Swan made early versions. In 1874 Woodward and Evans patented and made bulbs filled with nitrogen with carbon rods held between electrodes. They sold their patent to Edison in 1879.

Edison's phonograph and kinetoscope (progenitor of the movies) were much more popular inventions. But Westinghouse's invented a system of transmitting electricity that created an infrastructure. It was multiphase AC, transforming voltage up for long-range transmission, and down for home use. They used steam turbines and hydroelectric power to generate the electricity.

The only use for electricity then was light in the home and electric motors in industry. But electric appliances came later. Just as the Internet today has spawned huge changes in society, so too did Westinghouse's successful electrical distribution system in the 1890s. I consider such infrastructure inventions far greater than smaller individual inventions using that infrastructure, like the electric motor, the light bulb, etc.

Another differentiating point between Edison and Westinghouse was how many US patents they had. Edison had 1,093; Westinghouse had 361. But look under the surface to see why. Westinghouse insisted that any of his employees who developed a patent list it under their own name. By contrast, Edison insisted that any of his employees who developed a patent list it under Edison's name!



Thomas Edison 1847 – 1931, with his phonograph invention.

When Tesla came to the US to work for Edison, he paid him \$18 a week and promised him \$50,000 if he could redesign and significantly improve the DC system. Within two months Tesla did just that. When Tesla asked for the money Edison said he was joking and gave him a \$10 a week raise!

Tesla left. Westinghouse approached him and gave him \$60,000 to license his patents, 150 shares of stock, \$2.50 royalty per horsepower generated by his AC motor, and \$2,000 a month. Edison's raise was to \$28 a week! Edison also used mob connections to enforce his movie patents, pushing many early movie pioneers to Los Angeles. Edison and Westinghouse were very different men.

One day George drilled for gas in his back yard. Most wives would have castigated their husbands for wrecking the scenery. But Marguerite so loved him she was thrilled that he was spending more time at home rather than traveling to market his inventions. When he drilled for gas, he hit a huge natural gas deposit! So, in 1884 he went into the natural gas business distributing natural gas inventing valves, meters, distribution systems, etc.



Solitude, the Westinghouse home in Pittsburgh, note radio antenna.

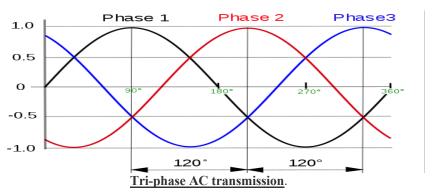
#### WESTINGHOUSE ASSOCIATED COMPANIES CHRONOLOGICALLY ARRANGED 1880 1910 WESTINGHOUSE AIR BRAKE CO. WESTINGHOUSE EUROPEAN BRAKE CO. COMPAGNIE DES FREINS WESTINGHOUSE AMERICAN BRAKE CO. WESTINGHOUSE BRAKE CO., LTD. WESTINGHOUSE MACHINE CO. WESTINGHOUSE FOUNDRY CO. UNION SWITCH & SIGNAL CO. WESTINGHOUSE CO. (SCHENECTADY) PHILADELPHIA COMPANY WESTINGHOUSE BREMSEN GESELLSCHAFT WESTINGHOUSE, CHURCH, KERR & CO. SAWYER-MAN ELECTRIC CO. WESTINGHOUSE ELECTRIC CO. CONSOLIDATED ELECTRIC LIGHT CO. UNITED ELECTRIC LIGHT & POWER CO. FUEL GAS AND ELECTRICAL ENG'R'G CO. EAST PITTSBURGH IMPROVEMENT CO. WESTINGHOUSE ELECTRIC & MANUFACTURING CO. WESTINGHOUSE ELECTRIC CO., LTD. (LONDON) BRYANT ELECTRIC COMPANY PITTSBURGH METER CO.

List of Westinghouse's companies taken from Westinghouse Corp website.

Westinghouse created a factory town in Wilmerding, PA with model employee facilities to open a massive air brake manufacturing plant. He built employee houses with inside bathrooms, electricity, etc.

A little more on the battle of the currents: In 1879 Edison started the Pearl Street generating station in New York City, to light the streets and supply electricity to 24 residents (J.P. Morgan, Edison's backer, was one of them). But, DC current needed generators every mile. Westinghouse bought the patents of Gaulard's (French), and Gibbs' (English) AC transformer and studied AC electricity. In 1886 he started the Westinghouse Electric Company initially as a research and development facility. He could power light bulbs with AC but no practical electric motor existed yet until Tesla invented one in 1887. Tesla also invented poly-phase transmission of AC.

If you run a single alternating current (phase 1 in the diagram) through a wire, you need two wires. If you run a second phase through another wire (phase 2 in the diagram) you need two outgoing wires but only one return wire. Thus, you have transmitted twice the electricity with only 50% more wire.



Westinghouse and Tesla both knew high voltages travelled further with less loss of power. They could then transform down the voltage for people's homes.

Edison exploited this, saying AC was unsafe. He got the New York legislature to adopt the electric chair instead of hanging criminals condemned to death. Edison said only AC could kill people and tried to introduce the word "to Westinghouse" someone. But it never caught on, instead we use the word "electrocute". The first AC electrocution was in 1890 with Edison's electric chair. It took four minutes of electrocution for the man to die! Westinghouse had focused instead on paying legal fees to free the convict! Edison was just "plain nasty".

In 1889 Westinghouse renamed his company Westinghouse Electric and Manufacturing Company (WEMCo). J.P. Morgan, who bankrolled Edison, wanted to buy out Westinghouse and merge him with Edison. But Westinghouse was suspicious of financiers and wanted to run his own show (more about that later). He also hired the first female electrical engineer in the US, Bertha Feicht, in 1893.



Columbian World's Fair popular electricity building – look at the crowds!

A quarter of the entire population of the US visited the Columbian World's Fair in 1893. Westinghouse bid significantly lower than Edison to light the exhibition. He knew that if it were successful, the advertising would work wonders. At the last minute, Edison tried to hobble Westinghouse by saying that his light bulbs were too similar to Edison's and sued him for patent violation. But Westinghouse had bought another patent for the Sawyer-Man lamp. He hastily geared up his factories to produce 250,000 of them just in time for the exhibition. Westinghouse's exhibit competed well with Edison's famous GE exhibit there.

Westinghouse was right. He was awarded the huge contract for the Niagara Falls Generating Station in 1895 that powered Buffalo, New York 20 miles away. This used his turbines to turn the generators, which could power a city many miles away. This was totally out of Edison's league!

In 1894 Westinghouse started a transportation division making electric trams, which ten years later was to partner with Baldwin to make diesel-electric locomotives. In 1899 he started the British Westinghouse Manufacturing Company. Two years later he supplied a steam turbine generator for the Hartford Electric Light Company.

J.P. Morgan had cherished the idea of crippling Westinghouse by calling in WEMCo. loans. In 1907 there was a panic (recession). Morgan gleefully called in the loans and crippled him. Westinghouse had always preferred to finance his next company with profits from his last one. But he had overextended himself with WEMCo in 1907. So, Westinghouse retired. He died of heart disease seven years later.

The company continued and produced the first tungsten light bulb in 1909. The year Westinghouse died WEMCo bought Copeman Electric Stove and entered the appliance market. In 1919 WEMCo created RCA with GE and AT&T. Two years later they started the first commercial radio stations in Springfield and Pittsburgh. In1926 they partnered with GE and RCA to form NBC broadcasting.

During the Second World War (1939-1945) WEMCo became involved with radar and jets. At the end of the war they renamed themselves Westinghouse Electric Company (WEC). They formed the Westinghouse Aviation Gas Turbine Division. In 1951 they built the first US TV, and the next year started a cathode ray tube facility. In the 1960s 1970s and 1980s, like so many US businesses they diversified all over the place. They bought and sold businesses involved in electronic vehicles, cinemas, real estate, finance, toys, 7-up, cable TV, musak, TV and radio stations, elevators, escalators, nuclear power, IT, telephones, broadcasting and HVAC! A nasty case of acquisition fever!

Westinghouse's legacy was his WEC. Edison's legacy was GE. Both were in the DJIA20 of 1916. GE was in the DJIA from 1896 to 1899 and from 1907 to 2018. Westinghouse was in DJIA from 1916 to 1925 and from 1928 to 1996. The George Westinghouse Museum is in Wilmerding, PA.



George Westinghouse Memorial built by ex-employees, Schenley Park, Pittsburgh.

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### **CHAPTER SIX**

## THE THIRD DOW JONES INDUSTRIAL AVERAGE IN 1928 WITH 30 STOCKS

The Dow Jones Industrial Average increased to 30 stocks in 1928, a year before the Great Wall Street Crash. US Gross Domestic Product (GDP) peaked in 1929 at \$104 billion. On Black Monday (October 28<sup>th</sup>, 1929) the US stock market lost \$14 billion. By 1932 US GDP had fallen to \$59.5 billion. GDP did not reach \$100 billion again until 1940. Unemployment during the depression averaged 20%, and at peak in 1933 was 25%. That means employment was 80%, except 75% at its nadir in 1933. So only the minority were destitute.



Ten of the new DJIA 30 companies in 1928 were pre-existing:

- 1. American Sugar
- 2. American Tobacco
- 3. North American Company
- 4. Tennessee Coal Iron and railroad, later US Steel
- GF
- 6. American Can
- 7. American Smelting/ASARCO
- 8. Goodrich
- 9. Texas Company/Texaco
- 10. Westinghouse

I have already told their stories in earlier chapters, so will not repeat them. Twenty new companies joined the DJIA 30 list for 1928:

- 1. Allied Chemical
- 2. Atlantic refining
- 3. Bethlehem Steel
- 4. Chrysler

- 5. GM
- 6. General Railway Signal
- 7. International Harvester
- 8. International Nickel
- 9. Mack Truck
- 10. Nash Motors
- 11. Paramount Publix
- 12. Postum Inc. (later General Foods)
- 13. RCA
- 14. Sears Roebuck
- 15. Standard Oil (later EXXON)
- 16. Texas Gulf Sulfur
- 17. Union Carbide
- 18. Victor Talking Machine
- 19. Woolworth
- 20. Wright Aeronautical



New York Times morning after Black Monday Oct. 28th, 1929.



#1. Allied Chemical Corporation Stock Certificate for 100 shares of common stock to Harwood & Co. dated September 1967.

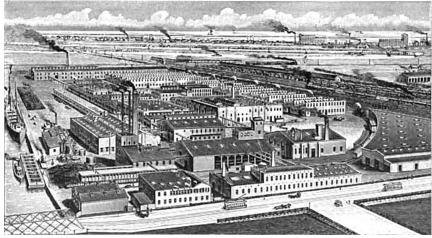
Hole and punch cancelled 11 + 6.77. Incorporated in New York State in 1920. Printed by ABNCo. Note the little round colored inclusions in the paper, which are called planchettes and are a security feature.

#1961



Vignette showing seated laureate allegory of chemistry, with thermometer, flask, retort and bottles. Laureate man on left with hammer and cogwheels for engineering and on the right a pickaxe and miner's lamp for mining.

William H. Nichols (1852-1930) did a master's degree in chemistry and started a small sulfuric acid company in 1870. With his son, Charles, he merged twelve companies together in 1899 to form General Chemical Company, of which he became president. He believed passionately in research and development and encouraged chemical education. An excellent businessman, he often quoted "the Golden Rule is as applicable in business as it is in church".



Schoellkopf works in Buffalo, NY circa. 1908.

In 1920 Nichols got together with Eugene Meyer, a financier, to merge five chemical companies to form Allied Chemical and Dye Corporation. The four companies were:

- 1. Barrett Chemical Co. (started in 1858).
- 2. Solvay Process Co. (started in 1881).
- 3. Semet-Solvay Co. (started in 1895).
- 4. National Aniline and Chemical Co. (started in 1917). They were a merger of Schoellkopf Aniline and Chemical, Beckers Aniline & Chemical, and Benzol Products, and made textile dyes.

Nichols and Meyer thought the companies would be complementary. During the First World War (1914-1918) Germany controlled most of the World's chemical production including dyes, drugs and ammonia (they used ammonia to make fertilizers and explosives). US companies expanded rapidly during the war to produce supplies vital for the war effort.

Nichols helped found the American Chemical Society. Since 1903, the society has awarded the Nichols gold medal award for original chemical research. Sixteen of those medalists also received the Nobel Prize for chemistry.



William H. Nichols, chemist & founder of Allied Chemical & Dye Co. 1920.



Nichols Gold medal, shows Goethe's idea of Dr. Faust in his laboratory.

Meyer grew up in San Francisco, got a B.A. at Yale, and then joined a finance company for four years where his father worked. In 1901 he broke out on his own, got a seat on the NYSE, and became an investor and speculator.



Eugene Meyer, Allied Chemical financier, later Fed Chairman & World Bank Head

Like Nichols, Meyer was no slouch either. During the First World War Meyer became the head of Wilson's War Finance Corporation and later became Chairman of the Federal Reserve from 1930 to 1933. After he stepped down from this post, he bought the Washington Post for \$825,000 and pumped money into it. After the Second World War Truman named him first head of the World Bank.

Allied Chemical and Dye built what became the largest ammonia plant in the world in Hopewell, Virginia in 1928. From 1920 to 1960 they were the largest chemical company in the US. They had conservative habits, borrowing nothing until 1966. But in the 1960s other chemical corporations surpassed them. They remained in the DJIA from 1925 to 1985 when they became AlliedSignal continuing in the DJIA until 2002.

In 1958 they changed their name to Allied Chemical Corporation. At that point they started making other products like nylon, refrigerants, plastics, etc. Profits were low and in 1962 they bought out Union Texas Natural Gas, which by 1979 generated 80% of their revenue. In 1981 they renamed themselves Allied Corporation. Two years later they bought Bendix Corp., which made auto and aircraft brakes. In 1985 Allied merged with Signal Companies Inc. (also in auto and aerospace engineering) to become AlliedSignal Corporation.

In 1999 Allied-Signal bought Honeywell for \$15 billion and changed their name to Honeywell International, a multinational conglomerate with four divisions:

- <u>Aerospace</u> e.g. avionics, engines, systems, space and airport operations, radar, brakes, navigation, military aircraft, satellites and turbochargers
- Home and building technologies e.g. thermostats, air and water control, HVAC, fire and intrusion detectors
- <u>Safety and Productivity Solutions</u> e.g. bar code scanners, protective clothing, "internet of things" products
- <u>Performance Material and Technology</u> e.g. gasoline refining technology, paper, mining, minerals, metals, pharmaceuticals, power transmission, foam insulation, electronic & other chemicals, resins, fertilizer

With a list like this it might be more appropriate to ask what they <u>don't</u> make! Honeywell International employs around 130,000 people. Their headquarters are in Morris Plains, NJ, because that is where Allied Chemical headquartered in 1958. Honeywell joined the DJIA in 2003 but was delisted in 2008. Like so many companies they had morphed from their origins into industrial factotums.

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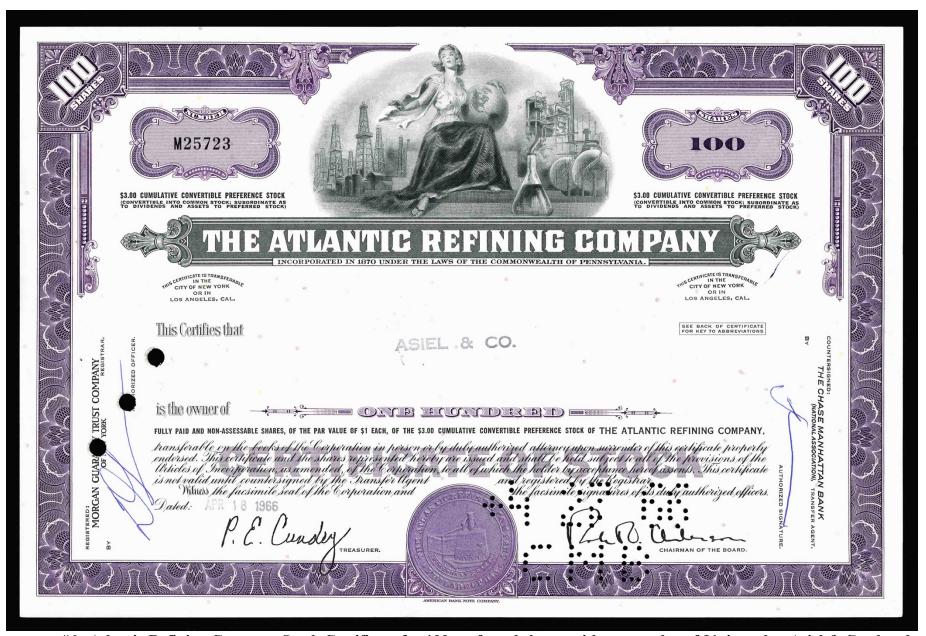
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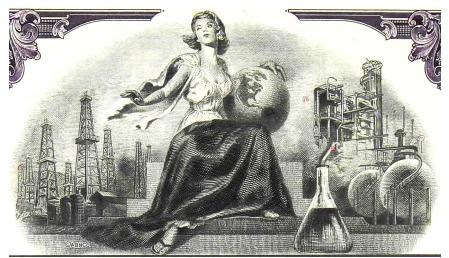
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#6. Atlantic Refining Company Stock Certificate for 100 preferred shares with a par value of \$1, issued to Asiel & Co. dated April 1966. Hole and punch cancelled + 4 27 66 CNB. Incorporated in Philadelphia, Pennsylvania in 1870. Printed by ABNCo. Notice planchette disc inclusions in paper as security device. #2008



Vignette called Female and Globe, engraver Joseph Keller, artist R. Lavin.

A female holds a globe. On the left are oil-drilling derricks; on the right is a refinery with a flask in the foreground. The vignette spells vertical integration except they left out railroads and ships! At least four different stock certificates use this vignette. Robert Lavin (1915-1997) did the artwork. After attending the National Academy of Art School, he served as a US Marine fighter pilot in the Second World War. He then illustrated for the Saturday Evening Post and Reader's Digest. His paintings are in the Smithsonian permanent collections.

Joseph Keller (1903-1987) engraved the vignette. After studying art at the National Academy of Design, he spent five years as a plate cleaner at ABNCo. Finally, in 1923 the chief engraver, Robert Savage, saw his artwork and assigned him to engraving. He retired in 1970. During his career he engraved 12 foreign bank notes, 24 stock certificates and almost 30 stamps.

The Atlantic Refining Company (ARC) started in 1865. Nine years later Standard Oil of Ohio acquired it. After the Supreme Court broke up Standard Oil in 1911, ARC again became independent.

Charles Lockhart and William Frew built a refinery called "The Brilliant" in Pittsburgh in 1860. They acquired seven other Pittsburgh refineries. In 1865 William Warden joined the Lockhart and Frew partnership. Pittsburgh in western Pennsylvania was the center of US oil production and refining from 1859 to 1901. In 1901 Texas took over as the center of oil refining.

In 1866 Warden moved to Philadelphia 300 miles away. There he took care of huge petroleum storage facilities and oversaw marketing. The three-man partnership briefly changed their name to Warden and Frew. Lockhart built a refinery called "The Atlantic" in Philadelphia at Point Breeze on the Schuylkill River (what a name! what a spelling!). Thus began the Atlantic Refining Company (ARC) from the Warden, Frew and Lockhart partnership, with Lockhart as president. Warden would later take over as president.

By 1891 the Atlantic refinery would produce 50% of the world's lamp kerosene and Philadelphia was exporting 35% of all US Petroleum.



1917 view of Atlantic Refining's Atlantic refinery on Schuylkill River.

In 1870, John Rockefeller and Henry Flagler founded Standard Oil Corporation of Ohio. Standard Oil bought out ARC in 1874. The Pittsburgh operations became Standard Oil of Pittsburgh. In 1876 Flagler bought an idle refinery of the Eclipse Lubricating Oil Co., 100 miles west of Pittsburgh, and added that to the Pittsburgh operations. They still called the Philadelphia operations ARC.

Rockefeller and Flagler had formed a partnership in 1863, then in 1870 a closely held Corporation of seven partners. Rockefeller owned 27% of this. They dominated the oil market for lamps and lubrication as well as byproducts like waxes and solvents. They integrated horizontally i.e. acquiring other similar oil distribution companies to become a monopoly. Later they integrated vertically e.g. drilling for oil, refining oil and acquiring railroads and ships to transport oil. In 1875 Standard Oil went public.



In 1875 Standard Oil Company went public issuing 35,000 shares of \$100.

Standard Oil became a trust in 1882, i.e. a holding company for other companies in different states. In 1885 New Jersey changed its laws allowing a company to incorporate in New Jersey despite being located in other states. This was just what the Trust needed. So that year they moved from Cleveland, OH, to New York City and started Standard Oil of New Jersey (SONJ). This became a holding company for 41 other companies each with their own territories. SONJ controlled all the other companies. They hoped this would protect them from accusations of monopoly. ARC controlled Philadelphia, southeast Pennsylvania, southern New Jersey and Delaware.

In 1890 US Congress passed the Sherman Anti-Trust Act. Two years later the State of Ohio sued Standard Oil of Ohio as a monopoly pushing them to dissolve. So, they simply separated Standard Oil of Ohio, and Standard Oil of New Jersey as two separate companies!

In 1892 Standard Oil consolidated all its operations in Pennsylvania (the richest US oil producer at the time) under ARC. ARC was one of Standard Oil of New Jersey's many subsidiary companies. The Texas Spindletop gusher appeared on the scene nine years later in 1901. Nevertheless, in 1904 Standard Oil still controlled 91% of all US production and 85% of all US sales.

In 1911 the US Supreme Court broke up Standard Oil into 34 separate "baby" companies, one of which was ARC. ARC's biggest sales were now gasoline for automobiles, rather than lamp kerosene. They had many roadside gas stations.

ARC built a pipeline from Philadelphia to Pittsburgh 300 miles away linking its two operations in 1936.



Left: ARC advertising sign 1915 – 1936. Right Advertising sign 1936-1966.

And now for some corporate slice and dice alphabet soup! Business schools taught that diversification was the spice of life before the 1970s. After rising to corporate executive status, managers eagerly played the game. ARC merged with Richfield Oil Corporation of California in 1966 to become Atlantic Richfield Oil Company of California. They changed their name to Atlantic Richfield Company (ARCO) in 1970, headquartered in Los Angeles. In 1988 Sun Company of Philadelphia bought ARCO and in 1994 bought Chevron (previously Standard Oil of California) and became Sunoco - still in business.

Sunoco bought an Allied Signal chemical plant in 1988, which they sold to Honeywell in 2011. Sunoco also bought convenience stores from Marathon Petroleum in 2003, and bought Mobil and A-Plus convenience stores. In 2010, they sold their Toledo, Ohio refinery, starting their exit from oil refining. Energy Transfer Partners bought Sunoco in 2012, selling it to Sunoco Logistics LP in 2016. In 2018, they sold 1,030 of their convenience stores to 7-Eleven.

Why give all these details? To illustrate a common lack of long-term strategic clarity in many US companies.



Miss Natalie O'Donald, ARC garage attendant in 1943 checking oil dipstick in automobile, during the Second World War.

Note nametag and ATLANTIC on blouse.

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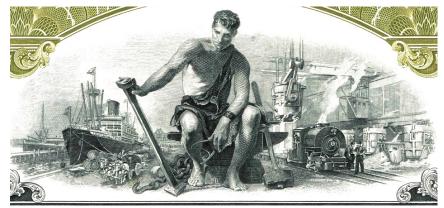
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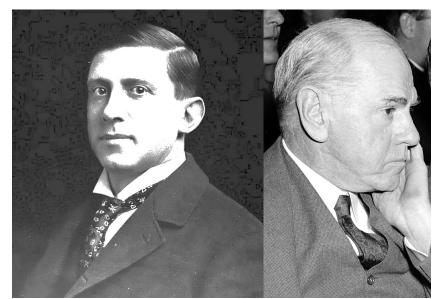


#7. Bethlehem Steel Corporation. Fifty shares of common stock to Miss Annie Dewitt, dated February 1957. Hole and punch cancelled 11.14.69 | PSU. Incorporated in 1919 in Delaware, note number matrix on right. Printed by ABNCo. #1960



<u>Bethlehem Steel vignette – man seated on anvil with hammer, calipers, chain & hook. On left, ocean steamer being loaded, on right train being loaded.</u>

In 1857 a group of railroaders and investors in Bethlehem, PA, founded the Saucona Iron Works in South Bethlehem. The next year they changed their name to Bethlehem Iron Works. They made wrought iron rails. After Bessemer invented his steel producing process in 1856 Bethlehem remodeled. By 1880 Bethlehem was in the steel business. In 1887 they got a contract from the US Navy to make armor plating for ships and large naval guns. In 1899 they changed their name to Bethlehem Steel.



Charles M. Schwab in 1901.

**Eugene Grace in 1955.** 

Charles M. Schwab 1862-1939 (no relation to Charles R. Schwab the banker) was President of the Carnegie Steel Company at the tender age of 35 in 1897.

After he helped negotiate the sale of Carnegie Steel to J.P. Morgan, he became the first president of US Steel. He resigned in 1903 and bought Bethlehem Steel as well as other steel companies on the east coast to make structural steel. Bethlehem Steel incorporated in 1904 and Schwab became its first President. Eugene Grace (1876 - 1960) took over from 1916 to 1945 and then became chairman until 1957.



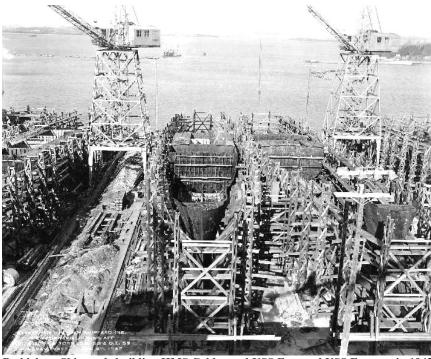
Early panoramic view of Bethlehem Steel in 1896.

In 1908 Bethlehem started making wide flange beams and different types of structural steel, an innovation for skyscrapers and large bridges. Bethlehem Steel built 85% of the New York skyline, the Golden Gate Bridge, the George Washington Bridge to Manhattan, the Verrazano Bridge to Staten Island, the US Supreme Court and the Rockefeller Center. They called the beams in those days H-beams, but now we call them I-beams. The Bethlehem Steel Company used the I-beam in its logo.



Bethlehem Steel logo showing their innovative structural H beam.

Schwab kept the unions out of Bethlehem Steel, breaking up their strike in 1910. He lived opulently and in the fast lane. But he lost everything in the 1929 Wall Street Crash, living out his remaining ten years in a tiny apartment. During the First World War Bethlehem had huge government contracts to build ships, munitions and guns. After the war, thousands of immigrants found work at Bethlehem. There were 30 to 40 ethnic groups that mixed well. From 1923 to 1991 Bethlehem led the world in producing railroad cars.



Bethlehem Shipyards building HMS Calder and USS Foss and USS Formoe in 1942

During the Second Word War (1939-1945) Bethlehem had huge government contracts. In 1940 sales were \$602 million. Eugene Grace's compensation was over \$500,000. In 1943 he promised to build a ship a day. Bethlehem completed 1,121 ships in their 15 shipyards. They had 180,000 employees and owned shipyards, mines, railroad car manufacturers and plants all over US.

But it was not a bed of roses. In 1940 Bethlehem workers had no benefits. Horrific injuries were commonplace. The next year a union (now called United Steelworkers of America) went on strike just to negotiate a 10-minute lunch break, and washrooms.

During the war Bethlehem hired women as security workers to prevent sabotage and spying. They carried .38 revolvers, acquiring the appellation "pistol packing mothers". They were usually professional women and received higher wages.

After the war Bethlehem recruited from Puerto Rico, mainly for the dreaded coke works and blast furnaces, both very tough jobs. In 1945 Bethlehem produced 89% of the world's steel. By 1958 Bethlehem owned 10 plants, 13 fabrication mills, 10 shipyards and 20 other manufacturing plants. They had 165,000 employees and made 23 million tons of steel a year.

But in 1959 a steel strike swept the nation for 117 days. Half a million steel workers walked off the job. Finally, they gave workers a 41¢ an hour raise (equivalent to a \$5 an hour raise today), vacations, pension and health benefits.



6", 10", 12" and 14" naval guns assembled in Bethlehem facility in the 1940s

The cultures of management and of blue-collar workers differed vastly. Management was bloated and disdainful of workers. Bethlehem had done so well, management thought they would last forever. So they managed the strike simply by raising prices.

Every steel company in the US followed suit. The government, convinced that there must be collusion, investigated for price fixing. It was this attitude that opened the door to cheaper imported steel in the 1960s. It was the end of an era.

Bethlehem had the world's best open-hearth systems. But in 1960 "mini-mills" started. They cost a tenth of an open-hearth system. Mini-mills typically melted scrap iron in an electric arc furnace feeding a continuous casting and rolling mill. The electric arc furnace could easily be started or stopped according to market demand. They often specialized e.g. producing only wire, pipe, rods or sheet. Typically, they each made 200,000 to 400,000 tons of steel a year.

In 1962 Bethlehem opened a sheet metal plant in Burns Harbor, Indiana, for the mid-west auto industry. But they were too late. Imports were already cheaper.

The media covered the bidding for the Twin Towers Trade Center in New York City extensively in the 1960s. Bethlehem underbid US Steel. But smaller companies who used cheaper imported steel underbid them both.

Bethlehem should have updated in 1960. But they did very little updating; they focused much more on public relations. By 1982 they lost \$1.5 billion and had to shut down many operations.

The cause of Bethlehem's failure was:

- management enjoyed being the top company and disdained other companies as well as Bethlehem blue-collar workers
- management resisted change and would not invest in new methods that other countries were using
- bloated management
- outrageous union contracts: pension and full medical benefits after only 30 years. You could join the company aged 18 and retire with full medical benefits and a pension aged 48.
- at the time one worker's productivity supported six retirees' benefits
- foreign competition with cheaper labor and more modern equipment

In 1995 the Bethlehem Plant closed. Later, they demolished it. But, more modern plants like the Sparrows Point Plant in Maryland continued.

In 2001 Bethlehem filed for bankruptcy. Two years later they dissolved and the International Steel Group bought them. The next year, protesting retirees demanded a 40% import tariff on imported steel to pay for their benefits. President George W. Bush got entangled in negotiations. He agreed to a 30% tariff for three years only. Later, the government took over the pension payments system for 90,000 retired employees. This was the largest government takeover of a company's pension plan in US history.

In 2005 Mittal Steel bought International Steel Group and in 2006 merged with Arcelor becoming ArcelorMittal USA. Authorities often cite the demise of Bethlehem Steel as one of the prominent examples of the demise of US manufacturing. The US could no longer compete with cheap foreign labor.

How is steel made? It starts off with iron ore, coke and limestone. They crush the iron ore and separate the particles with iron magnetically to make purified iron ore. Coal is placed in low oxygen ovens at 2,400° F for a day, which removes tar, coal gas and other impurities and forms coke.

They then mix coke with limestone (calcium carbonate) and purified iron ore in a blast furnace at 2,000° F. The limestone collects impurities and floats as slag on the top of the molten iron. They scoop off the slag and the molten iron drops to the bottom of the furnace.

Next they put the molten iron into a Bessemer furnace with scrap iron. A water-cooled tube blows pure oxygen into the molten metal creating a 3,000° furnace. This burns off impurities like sulfur, phosphorus, carbon and silicon. After 20 minutes it changes to steel. Metallurgists analyze samples and add final additives like titanium, aluminum, molybdenum, nickel, chromium or manganese to produce steels with special properties.

Pig iron contains over 2% carbon and is brittle and rusts. Steel contains less than 2% carbon and is resilient and rusts less.

They pour the molten steel into pans creating 40-ton slabs 9 inches thick. They then transfer the slabs to continuous rolling mills, heated up, and rolled to their final thickness. Because the bars are thick, the rolling mill line can start at a very slow speed but end up moving at 60 mph. Continuous rolling mills are typically half a mile long. What started as a 40-ton 9" thick slab can itself end up half a mile long! The sheet can then be cold rolled which makes it smoother and stronger. Pickling it in hydrochloric acid can make it even smoother.

They then ship coils as cold rolled steel, the same thickness as a credit card, for stamping into automotive bodies, white goods, etc. Dipping the sheet in molten zinc makes galvanized steel, which resists rust. Electro-galvanized steel is an even better product, which is smoother and preferred for auto bodies. Aluminum coated steel resists heat and is good for exhaust systems, tail pipes, furnaces and drains.

Today the US is the world's largest steel importer. The US imports 30% of its 120 million tons a year of steel. They imported 35.3 million tons in 2015 from over 90 countries, accounting for 1.4% of all US imports. In 2016 the US made 78.5 million tons of steel. By contrast China makes 832 million tons, Japan 105 million tons, and India 102 million tons a year. The three largest US producers are Nucor (24 million tons per year), ArcelorMittal USA (15 million tons per year) and US Steel (14 million tons per year). Chief raw steel products are wire, bar, pipe and tube, sheet, rod and rebar, stainless steel, and I-beams. Bethlehem steel was in the DJIA 30 from 1928 to 1996.

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#8. Chrysler Corporation stock certificate for one share of common stock issued to Diane Cliff dated February 1960.

Punch cancelled 12.13.83. Note share number matrix on right. Seal shows incorporation in 1925 in Delaware.

Printed by Security-Columbian Banknote Company. Note planchette disc inclusions.

#1976



Vignette shows two ladies displaying wreathed shield with hood ornament.

Two shields with a "C" below this Vehicle scenes in the background.

This description of Chrysler will be longer than others. I will review the history of Chrysler under the following headings:

- Birth from Maxwell Motors with Plymouth, Desoto and Dodge
- Marque expansion, Chrysler, 1955 Imperial, 1960 Valiant
- 1960s pony cars, and performance cars
- 1973 fuel crisis leads to K cars under Iacocca
- 1983 Minivan introduced then Jeep Grand Cherokee
- 1993 LH platform
- 1998-2007 DaimlerChrysler era
- 2007 sale, big 3 TARP bailout, 2009 Fiat → Fiat Chrysler Autos

# Birth from Maxwell Motors with Plymouth, Desoto and Dodge

Walter P. Chrysler (1875-1940) started as a railroad machinist, earning his master mechanics papers in 1899 aged 24. He became President of Buick, and in 1919 rose to Vice President of GM. The next year he retired aged45 and became financially independent. He had already rescued Willys-Overland Motors. In 1921 Maxwell Motors convinced him to become chairman. So he brought with him the "three musketeers" Skelton, Breer and Zeder, who had been legendary engineers at Studebaker.

Walter got the failing Maxwell Motors going again, with the revolutionary Chrysler 6 in 1924, which sold a record number of units - 32,000 that year. In 1925 he bought a controlling interest in Maxwell and renamed it Chrysler. He started marketing the Chrysler 6 in 1925, and a cheaper 4-cylinder auto under the Maxwell marque for one more year, and then switched to the name Chrysler.

In the 1920s, Chrysler pioneered air filters, oil filters, full pressure lubrication in the engine and high compression engines. Later, Chrysler would also pioneer four-wheel hydraulic brakes in mass-produced cars and rubber engine mounts.



Walter P, Chrysler (1875-1940) in 1937 photograph.



**Chrysler 70 Touring Car 1924** 



Plymouth PA De Luxe 4 Door Sedan 1931.

# Marque expansion, Chrysler, 1955 Imperial, 1960 Valiant

Early on there were four marques:

- Plymouth, the low priced one, which started in 1928, lasting till 2001.
- Dodge, for the working man and farmer, but better than Plymouth
- De Soto for the middle class which lasted till 1961
- Chrysler the top of the line.



1926 Chrysler Imperial Series E 80 Phaeton.

He introduced the Chrysler Imperial model in 1926, which would become a marque itself in 1955, superior to the Chrysler marque. In 1960 Chrysler started the Valiant marque for the lowest-priced cars. The marque lasted till 1976.



In 1928 Chrysler built the modernistic Chrysler building in New York City.

In 1934 Chrysler introduced a modernistic design called the Airflow at the World's Fair (The "Century of Progress" in Chicago). The innovative car sported futuristic aerodynamic styling, and had a cushioned ride. They made 13 different models priced from \$725 to \$1,200. But they only sold 7,700. After a year they dropped it. In 1936 Chrysler was the second largest US auto manufacturer. By 1949 they became the third largest after GM and Ford.



1936 Chrysler Airflow- an avant-garde design.

During the Second World War Chrysler switched from passenger autos to military production. They made 500,000 Dodge trucks, over 25,000 Pershing and Sherman tanks, radar systems, gyrocompasses and anti-aircraft guns. After the war they continued government contracts with guided missiles in the 1950s and space rockets in the 1960s.



Chrysler Imperial 1955, which became a marque not just a model.

In the early 1950s Chrysler did well. They introduced the "lower, longer look" with their new Imperial. In 1956 they introduced the first all-transistor car radio. In 1956 they had 20% of the auto market with profits of \$19 million. The next year their profits jumped to \$120 million. But in 1958 "tin-worm" reared its ugly head (rust!). Parts fell off, torsion bars snapped, and sales lagged. Chrysler hobbled along for a bit.

## 1960s pony cars, and performance cars

The 1960s brought further innovations. Except for Imperials until 1967, Chrysler was the first major US auto manufacturer to make all their cars using monocoque construction i.e. a structural skin. Chrysler pioneered the switch from a DC to an AC alternator, which worked better. They introduced "pony cars" and "muscle cars". Pony cars like the Ford Mustang were affordable, compact, and sporty. Chrysler's answer was the Barracuda.



Plymouth Barracuda 1966, first produced in 1964, a pony car.

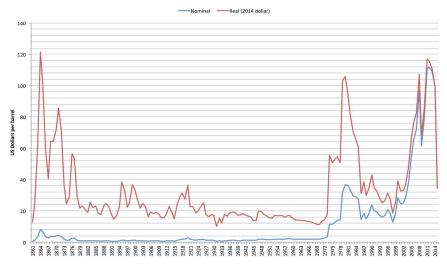


Dodge Charger, one of Chrysler's "muscle cars" introduced in 1964.

Chrysler muscle cars were affordable "Hemi" (dome not flat head cylinders) high performance cars like the Plymouth GTX and the Dodge Charger. Their three markets became low-cost sports cars for the young, station wagons for families and luxury autos.

In 1964 Chrysler bought control of the Routes group in UK, Simca in France, and Barreiros diesel in Spain. A decade later they sold them as Chrysler Europe to French automakers. But something else was looming on the horizon: OIL!

### **CRUDE OIL PRICES SINCE 1861**



## 1973 fuel crisis leads to K cars under Iacocca

As you can see from the above graph crude oil prices <u>inflation adjusted</u> for 2014 dollars from 1930 to 1970 was \$16 to \$20 a barrel. In 1973 it started climbing, the next year reaching \$50, and again climbed in 1978 reaching over \$100 by the next year in inflation adjusted terms. Had you asked people at the time, they knew oil was \$2 to \$3 a barrel, then suddenly between 1973 and 1980 it increased tenfold to \$37 a barrel.



Subcompact 1973 Mitsubishi Galant, re-branded as Dodge Colt in US.

To do market research and design and gear up production for a new car took several years. And it required a huge investment. Virtually all of Chrysler's car line-up were gas-guzzlers. Chrysler was lucky enough to buy 15% of Mitsubishi Heavy Industries (MHI) in 1971 and began selling their subcompact Mitsubishi Galant as the Dodge Colt in US. It took five years for MHI to ramp up production from 500,000 to 1,000,000 cars a year. In 1985 they partnered 50/50 in <u>Diamond-Star</u> motors (Mitsubishi three <u>Diamonds</u> and Chrysler penta-Star) building a US factory to produce 240,000 vehicles a year by 1988. But in 1991 Chrysler sold its share back to MHI. The oil scare was over in 1985.

This interlude was not nearly enough to save Chrysler. By the late 1970s Chrysler were close to bankruptcy. So to turn them around in 1978 they hired Lee Iacocca. Iacocca knew Chrysler needed cash. So he reduced his salary to \$1 a year and asked the government for a \$1.5 billion loan. He was quite the salesman. He prepared a list of how many unemployed people each state and each large town would have if Chrysler went belly up. Then he appeared on TV and before Congress to make his case. He was indeed persuasive and got his money.



Lee Iacocca while President of Ford at a TV interview.

By 1983 he had turned Chrysler around and repaid the loan, together with \$350 million in interest back to the federal government. How did he do it? With the K car! In point of fact, his tenure was a trifecta: K cars, minivans and Jeep Grand Cherokee. The K car was a pivot car to give Chrysler breathing space till they introduced the revolutionary minivan. Iacocca had been President of Ford, and the one responsible for the 1964 Ford Mustang. He had also pushed development of the Ford minimax, a front-wheel-drive minivan, developed by Hal Sperlich, another Ford visionary. But Chairman Henry Ford II nixed the minimax because it competed with their station wagons.

Henry Ford II fired Sperlich then Iacocca. They both ended up in Chrysler. Sperlich had experience in front-wheel-drive automobiles, having spent time in Europe. Not only did he introduce K cars, he had designed the Ford minimax. In 1977 Chrysler introduced the subcompact L cars, the Dodge Omni and Plymouth Horizon, re-engineered from Chrysler Europe autos.



Simca (Chrysler in France) Chrysler Horizon GLS 1979.

In 1981 Chrysler came out with a US produced FWD, transverse engine, independent front suspension configuration, called the K car, derived from the L cars. They were mid-size cars, called the Dodge Aires, and Plymouth Reliant.



Plymouth Reliant Station Wagon 1981-1989. Based on K car chassis.

K cars lasted from 1981 to 1989. The \$2 to\$3 per barrel oil of 1930 to 1970 had increased to \$37 in 1980 and stayed in the \$27 to \$35 range till 1985. So customers wanted fuel-efficient cars. But they still had a love affair with big cars. Oil averaged \$12 to \$28 a barrel from 1986 to 2002 (not adjusted for inflation). In 2008 it suddenly shot up again to over \$100.

Yearly model changes and badge-engineered gas-guzzlers had been the order of the day. But bright new business minds saw other possibilities. New thoughts were four-wheel-drive, fuel economy, quality, return to 4-cylinder engines and front-wheel-drive (FWD).

## 1983 Minivan introduced then Jeep Grand Cherokee

Enter the minivan! In 1950 VW produced its iconic minivan. In the 1960s, auto manufacturers made passenger and cargo vans. Then in the 1970s small groups at Chrysler, Ford and GM worked on a minivan with more space than a station wagon, but that still drove like a car.

The big 1970s research project was the Ford minimax, masterminded by Hal Sperlich. Most of the Ford minimax team ended up moving to Chrysler. Chrysler was hurting. It needed something innovative. GM and Ford had rejected minimals. Chrysler already had experience with FWD. The stage was set for the minimal!

A Chrysler manufacturing plant in Ontario tooled up to produce the minivan for release in 1984. Ontario plant employees knew that if the project failed, they would lose their jobs. They also knew they if they did not get the minivan project, they would lose their jobs. The project turned into a bonanza! Minivans became a phenomenon. Chrysler never thought it would be this big.



1985 Plymouth Voyager LE Minivan.

FWD made them easier to drive and lowered the floor so you could get in and out of them easier than a rear-wheel-drive. The FWD made the van lighter and the low floor also made them fit in people's garages. Engines in the front rather than between the front seats protected occupants in a crash. The wood side trim looked like station wagons, and whitewall tires looked more like an auto.

The rear single sliding door, initially on one side only, turned out to be a problem. For some reason they did not fix it until 1995. Initially they used a four-cylinder engine from the K cars but soon found the minivans underpowered. In 1987 they added a V6 engine, which solved the problem. One of the rules they followed was that buyers should be able to fit in a piece of 4'x 8' plywood in the back, which a station wagon could not do.

In the first year they sold 200,000 minivans from the Ontario plant. They could not keep up. Iacocca decided to build a new plant. They sold 600,000 minivans a year, more than almost every other US passenger car. Chrysler made \$6,000 a unit with an average sticker price of \$19,000! The market was wide open! GM and Ford did not even compete until 12 years later! It was a bonanza! In 1995 Chrysler finally put back doors on both sides and called it the Plymouth Voyager. The minivan had saved Chrysler.

In 1987 Chrysler bought Lamborghini (which it sold in 1994). It was not a useful marriage, but they did cooperate on a few projects. Lamborghini helped with the V10 Dodge Viper engine. Also in 1987, Chrysler bought AMC (American Motors Corporation) to take over the Jeep brand. Jeep had been designing a Jeep Grand Cherokee. But Iacocca was too busy with the minivan. He put things on hold till 1993 when they released the Grand Cherokee to compete with the Ford Explorer. The Jeep Grand Cherokee became an iconic and successful Chrysler product. Their stable now had the corner on minivans, Jeep Grand Cherokee, aging K cars, as well as trucks. By 1990 Chrysler was the most profitable automaker in the world because of their high profits and low production costs



1993-1995 Jeep Grand Cherokee.

In 1988 Iacocca bought Gulfstream and ElectroSpace systems to protect Chrysler from cyclical auto industry changes, but it decreased working capital from \$14 billion to \$2 billion. Some thought Iacocca was getting bored with cars. But like so many CEOs, he just had acquisition fever. In 1992 he retired and Bob Eaton took over as CEO.

### 1993 LH platform

In 1993 Chrysler came out with the LH platform. The "cab forward" design increased space in the passenger compartment. They called the first Chrysler LH the Concorde, which they redesigned in 1998. A lot of discussion took place over what LH stood for. Journalists said it stood for "last hope"! Chrysler retorted it stood for "latest hit"! But in reality, it did not stand for anything!



1993-1997 Chrysler Concorde, the cab forward LH platform.

At one time, automakers could market specific cars to specific groups, but in the late 1990s that stopped. By the mid 1990s Lexus and BMW were competing internationally and making more money than Mercedes. In 1997, Chrysler had a 23% US market share. Their LH platform, minivan, Jeep Grand Cherokee and Dodge Ram were all prime vehicles.



First-generation Dodge Ram truck 1981-1993.

## 1998-2007 DaimlerChrysler era

Then in 1998 Mercedes Benz bought Chrysler to get into the North American market. They thought they could learn efficiency from Chrysler. The new company was called DaimlerChrysler.

Daimler Benz started in 1926. The Director, Emil Jellinek had a daughter, Mercedes, hence the name Mercedes. They cultivated an image of luxury and dependability. They produced the first diesel in 1936, the 260D. They also produced the first direct fuel injection (DFI) in the 300 SL gull wing. By 1998 Daimler Benz had huge numbers of employees. What they wanted was a North American partner with access to the North American market that was more efficient. Chrysler seemed like the ideal candidate. In 1998 Daimler did a stock swap with Chrysler for \$37 billion to form DaimlerChrysler (DC).

The Daimler CEO Juergen Schrempp talked of an equal partnership. But it turned out to be a marriage of opposites. Daimler was holier than thou, and very hierarchical. Chrysler was a risk taker and much less hierarchical. Schrempp disdained Chrysler, even more so when they found that Chrysler made four times more profits than Daimler did! They never truly cooperated.

In Europe the new DaimlerChrysler pushed their A class (tiny cars). As it turned out, they were terrible cars that dragged down Daimler's reputation. Eaton left Chrysler as CEO. In 2000 they made Dieter Zetsche CEO of Chrysler. He came across as a smooth operator in public, so much so that the public thought he was an actor not a CEO!

By 2000 Chrysler lost \$512 million in sales, and shares dropped from \$108 to \$40. Schrempp finally announced that indeed Chrysler and Daimler were not equal partners. They had always intended to make Chrysler into a subsidiary. Although the merger trumpeted how they would complement each other, it made no business sense. They did not interact. They did not merge production, marketing, sales or engineering. The culture conflict could not have been clearer. Daimler was impossibly snooty.

In 2001 DaimlerChrysler stopped the K car line, removing the focus on the people's car. They launched the Sebring and the Jeep Commander, both unsuccessful vehicles.

In 2005 Chrysler launched the Chrysler 300 (named after the original Chrysler 300 which had 300 horse power), a much better vehicle. Many earlier Mercedes Benz buyers switched to the Chrysler 300. In spite of its success, DaimlerChrysler management decided that Chrysler, Jeep and Dodge should share dealerships. They pushed more cars on dealers than they could sell.

In 2006 DC lost \$1.5 billion. They realized too late that their marriage had cost them dearly. Daimler's had lost brand loyalty and reputation. And they never got any synergy from Chrysler's low production costs and high sales. So they divorced. Daimler sold 80% (\$2.6 billion) of Chrysler to a private equity group Cerberus Capital Management in 2007. Daimler kept 20% (\$650 million).

### 2007 sale, big 3 TARP bailout, 2009 Fiat -> Fiat Chrysler Autos

Then fuel prices started to rise again - \$50 a barrel in 2005, \$70 in 2007, \$94 in 2008, and \$107 by 2011. With oil that high Ford, GM and Chrysler were stuck with SUVs and trucks that no one wanted. So in 2008, GM, Ford and Chrysler went to the government for a TARP (Troubled Asset Relief Program) bailout.

Hell! Everyone else was getting bail outs from the government why not the auto companies too!

Congress bailed them out to keep them afloat. In 2009 Chrysler filed for bankruptcy. The government took them over and ordered them to merge with Fiat Sp.A., making them the sixth largest auto manufacturer in the world. After they overhauled their auto line-up, Chrysler repaid \$11.2 billion of its \$12.5 billion TARP loans in 2011. TARP paid out \$431 billion in 2012. Luckily it got back \$442 billion.

In 2014 Chrysler became Fiat Chrysler Automobiles (FCA US LLC). In 2015 Consumer Reports named FCA the worst US Car company – the ultimate rebuke for the underdog manufacturer for the common man Chrysler had always espoused. Today Chrysler - a shadow of its former self -- produces only the 300, a nice sedan, and the Pacifica, their latest minivan. Chrysler was part of the DJIA from 1928 to 1978.

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#10. General Motors Acceptance Corporation 3½% bond 1936-1951. Specimen Certificate, serial # 00000, unsigned, unissued, stamped SPECIMEN, and hole cancelled. Corporate seal shows incorporation in New York in 1919. Printed by ABNCo. #1926.



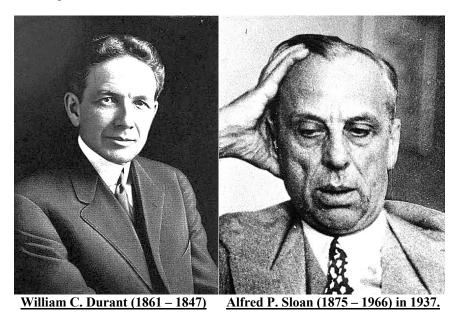
GM joined the DJIA in 1915 for a year then again from 1925 till its bankruptcy in 2009. This was the longest streak in the DJIA for any US company except GE.

William Crapo Durant (yes that was his name!) dropped out of high school to work in his grandfather's lumberyard in Boston. Then he sold cigars in Flint, Michigan. Then he turned to selling carriages. In 1886 he partnered with Josiah Dort with \$2,000 start-up money to form the Durant-Dort Carriage Company in Flint, Michigan. By 1900 it was the world's biggest manufacturer of carriages and valued at \$2 million. He also owned several Ford dealerships. In 1908 Durant capitalized a holding company called General Motors. That same year he bought out Buick and Oldsmobile.

In 1909 GM bought Cadillac (for \$5.5 million) and Oakland (now Pontiac) and several other truck and auto companies. GM sold 25,000 vehicles. Durant then negotiated to buy Ford for \$8 million. But he had overextended himself. His bankers refused the loan and took over GM, who then dismissed Durant. Incidentally, Cadillac was the first to pioneer closed autos providing all-weather comfort. At the time all autos were open to the elements.

In 1911 Durant founded Chevrolet with Louis Chevrolet (a successful Swiss racing car driver). The company did well. So well in fact, that he got R.S. McLaughlin, a Canadian auto manufacturer, to bankroll him to regain control of GM. Durant bought 54.5% of GM's stock and resumed the Presidency of GM

in 1915. Durant also invented the idea auto dealer franchises. McLaughlin became president of GM Canada.



GM incorporated in 1915/6. The previous certificate is for the GM Acceptance Corporation, the financing arm of GM, incorporated in 1919. They started a truck division called GM Truck Company, later known as GMC. Cadillac introduced the first electric starter in their 1912 model, and in 1915 also introduced the first water cooled, thermostatically controlled V8.



Cadillac Model 30 Touring Car 1908 to 1911, similar to 1912 model.

In 1918 GM built employee housing. And as with modern 401ks, they matched dollar for dollar employee investment in buying their houses. By 1919 they had 85,000 employees in Detroit, Michigan 70 miles from Flint where they had their headquarters. After the First World War auto ownership really took off.

Initially Chevrolet and Pontiac were 4-cylinder models and Buick and Cadillac were 8-cylinder models. Durant had a pet project, a 6-cylinder "Sheridan" marque. Eddie Rickenbacker, a First World War flying ace, was to promote it.

In 1920, Durant lost control of GM to shareholders Pierre Du Pont and R.S. McLaughlin. Durant then bought out the Sheridan rights and plant at Muncie, Indiana, and formed Durant Motors trying to compete with GM. But his company failed in 1933. Durant also bought up lots of stock (against friends' advice) during the Wall Street Crash of 1929, leading to his bankruptcy. However, R.S. McLaughlin generously arranged a pension for him and he eked out his days managing a bowling alley in Flint, Michigan, until he died in 1947.

Meanwhile, in 1921 GM patented tetra-ethyl lead as an anti-knock agent. This allowed higher compression ratios, improving performance. They then partnered with Standard Oil of New Jersey in 1925 to market it.

Alfred Sloan (1875 – 1966, see photo opposite) became President of GM in 1923 until 1946. He was also chairman from 1937 to 1956, so influenced GM for 33 years. He wrote a book in the 1950s called *My Years with General Motors*, considered a groundbreaking text in modern management. He pioneered the concepts of yearly styling changes and planned obsolescence.

In 1925 GM bought Vauxhall in England, and in 1926 bought Hertz Corporation, the car rental company. Hertz bought it back in 1953 and went public. In 1926 GM bought Yellow Coach Manufacturing Company, who made Greyhound Buses. In 1929 GM bought an 80% share in the German auto company Opel, and in 1931 bought the Australian auto company Holden. GM had grown into an international company.

Sloan targeted each marque to a specific socio-economic market segment, calling their stable of marques the "ladder of success". A young man would start with Chevrolet, and then as he became more successful would climb through Pontiac, Oldsmobile, Buick and finally Cadillac. Thus, each marque did not compete with another in GM. This kept buyers "in the fold".

Sloan's marketing contrasted sharply with Henry Ford, who was probably one of the worst CEOs in automotive history (though he was an amazing engineer, and one of the pioneers of the production line). Ford focused on cost, to make the cheapest car possible, though he wanted reliability and functionality. He famously said: "they can have whatever color they like so long as it is black". He said this to emphasize lower production costs if all cars were identical. But he knew it was an unwise quote. In point of fact they made the Model T in red, green and many other colors.

Ford constantly shot himself in the foot. He spurned accountants, spurned buying on credit, spurned styling changes and spurned annual updates. When advisors finally persuaded Ford to make the Model A, he shut down production for 17 months to tool up for it!

Sloan understood that cars were not just safe reliable transport, but also status symbols. He also pioneered financing, starting GMAC in 1919, so people could afford to buy the car without saving up. It was another ten years before Ford would offer financing for his Model A.

Although the Wall Street Crash of 1929 devastated many companies and many people, large companies, especially those with many foreign branches like GM, did well. Ford, GM and Chrysler outlived the depression. Chrysler even grew.

In 1930 GM bought the Fokker Aircraft Corporation of America and added other aircraft corporations creating North American Aviation in 1933, which they sold off in 1948.

GM also bought the Electro-Motive Corporation and Winton Engine in 1930 to form the GM Electro-Motive Division. They built most US diesel locomotives that replaced steam locomotives between 1950 and 1980.



Vignette from GM stock certificate showing diesel-electric locomotive.

In 1932 GM founded United Cities Motor Transport (UCMT) to manufacture buses to replace city streetcar systems. After 1936 GM bought up streetcars and local railroad companies to start a market for their buses. This has been called the GM Streetcar Conspiracy. In 1949, after they bought National City Lines of L.A., courts convicted GM of conspiracy, with slap-on-the-wrist fines.

In 1935 the United Auto Workers Union struck at the Flint plant and later at other factories. GM ignored them for two years. Then FDR persuaded GM to recognize them. In 1940 GM produced the first automatic transmissions in the Series 60 Oldsmobile, called the "Hydra-matic", a 4-speed automatic. They came out as a 2-door or 4-door, coupe, sedan, convertible and station wagon.



1940 Oldsmobile Series 60 Sedan, first US auto with automatic transmission

After Pearl Harbor on December 11<sup>th</sup>, 1941, GM switched from auto production to the war effort. During the Second World War (1939 - 1945), GM was the top-ranked US corporation for war contracts. England's Vauxhall plant made Churchill tanks used in North Africa and Canada's GM plant made 500,000 logistics vehicles.

GM dwarfed other US automotive companies in size. GM's war production stretches credulity: 120 million shells, 39 million cartridge cases, 200,000 aircraft engines, 13,000 naval fighters and torpedo bombers, 97,000 aircraft propellers, 38,000 aircraft gyroscopes, 38,000 tanks, 854,000 trucks, 190,000 canons, 1.9 million machine guns, 3 million carbines, 4 million electric motors, 11 million fuses and 200,000 diesel engines!

An engineer and not a people-person, Alfred Sloan was anti-Union and anti-FDR. Hitler nationalized GM's German Opel plant in 1939 so GM took a \$22.7 million tax write-off. At the end of the war GM then claimed reparations of \$33 million because the Allies had bombed Opel! That's business!

Nevertheless, Sloan became a great philanthropist. In 1945 he donated \$4 million to create the Sloan-Kettering Institute for Cancer Research. He had the institute overseen by Kettering, GM's VP and director of research. Kettering had invented the electric self-starter in 1911, which became standard in the Cadillac the next year.

1948 saw the first automobile fins on a Cadillac, which would later grow to hideous proportions!



1948 Cadillac, note the small fins on back, which would later become huge.

In the 1950s GM earned more money than any other corporation. Charles Wilson, GM President (who later became secretary of Defense in 1953) said "what is good for the country is good for GM and vice versa". People later often incorrectly quoted this, as "what's good for GM is good for the country". In 1954 GM enjoyed a 54% share of the US auto market. In 1955 they became the first US company to make over \$1 billion in profit. The next year they earned \$13 billion, double that of its closest competitor Standard Oil of New Jersey (later EXXON).

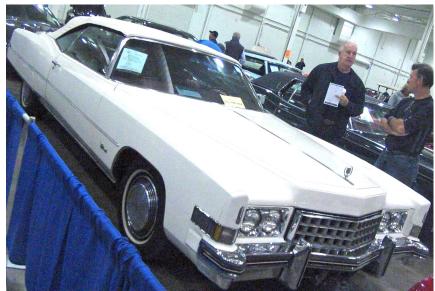


1962 Corvair Monza Spyder, first production turbocharged auto.



1960 Chevrolet Corvair, a small car with rear engine to compete with imports.

In 1960 reacting to small European car sales, GM introduced the Chevy Corvair, a small car with a rear engine. Two years later GM made the first production turbo engine in the Corvair Monza Spyder. In 1965 Ralph Nader published "Unsafe at Any Speed" about the Chevy Corsair, the first of a string of GM public relations problems. The car was unstable. Nader's book led to congressional auto safety hearings.



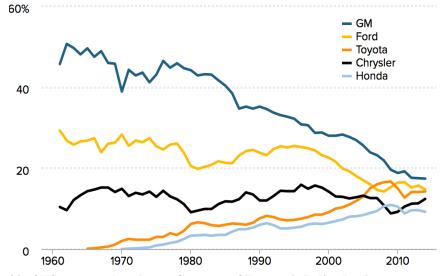
Cadillac Eldorado 1973 7<sup>th</sup> generation, first was 1953. The 1972 Eldorado, and Oldsmobile Toronado were the first US production autos to have ABS.

In 1972 GM produced the first anti-lock brake system (ABS) for the Oldsmobile Toronado and Cadillac Eldorado.



# Chevrolet Vega 1971, prone to rust and engine block overheating.

The Eldorado pictured opposite did just 9.4 miles to the gallon! In the 1970s, addressing the 1973 fuel crisis, GM made the small Chevy Vega - another public relations disaster. It often rusted after only two years, engines overheated, it ate up oil. Strike workers even sabotaged the car. Dealers told stories of touching up rust spots in new Chevy Vegas while still in the car showroom!



## % of US auto market share. Courtesy of Economic Policy Institute.

In the 1970s Japanese imports increased primarily because of better fuel economy during the 1970s fuel crisis. In the 1980s Japanese imports increased because of better quality and fewer breakdowns. By 2000, US autos were more comparable in economy and quality, though their reputations had suffered. Fuel costs increased again between 2000 and 2010 then fell. Minivans, trucks and SUVs replaced "yank tanks". America still thirsted for big cars. Then in the 1980s Oldsmobile became so popular that GM put Pontiac or Chevy engines in them without telling customers. This spawned a class action suit.

In 1981 Roger Smith became GM CEO until 1990. He invested in robotic assembly. In 1983, to compete with small Japanese imports, he announced the Saturn project. However, only in 1990 did the project finally get off the ground. Saturn was a small car marque with "friendly" marketing, just like Subaru's icky "love" marketing today.

During Smith's tenure GM's market share dropped from 46% to 35%. His answer? Acquisition fever! He bought EDS (Electronic Data Systems) in 1984, which they later sold in 1996. He also bought Hughes Aircraft in 1986, which they also later sold in 1997. GM struggled to make money. In 1986 they employed an amazing 866,000 people. Smith announced the closure of 11 plants. But the unions objected, and prevented him from doing this unless product sales fell. In the 1980s profits were only1% to 5% of revenues.

After near bankruptcy, the new CEO, Jack Smith (no relative of Roger), cut costs in the early 1990s. US auto manufacturers increasingly competed with imports. But they were denied access to those very same markets whence the imports came. Presidents Regan and Clinton would try leveling the playing field.

In 1993 VW stole Jose Lopez from GM, hours before GM appointed him CEO. GM sued VW. Prosecutors found VW with secret GM documents including details of future Opel models. VW's stock price plummeted, so they fired Lopez and reached a civil agreement with GM.

Customers bought fuel-efficient autos during the fuel crises like the 1970s, and from 2000 to 2010. But when fuel got cheaper, they returned to their first love - big cars. SUVs replaced big cars, helping GM sales. In 2000 GM bought Saab.

But in the 2000's GM struggled. They had not properly funded retiree health costs though they had funded their worker pensions. In 2004 they stopped the Oldsmobile line. They sold parts of their stakes back to Fiat, and Suzuki. In 2006 they sold off 51% of GMAC to Cerberus Capital Management, sold off their mortgage and real estate units and sold their stakes in Isuzu and Allison Transmission. In 2007 GM lost \$39 billion. They negotiated a contract with unions to pay new hires \$14 an hour. Hourly labor costs (including benefits for Detroit producers in 2008) averaged \$73.21 versus \$44.20 for non-Detroit "transplant" producers — a huge difference. GM's reign as the world's largest auto manufacturer had lasted longer than any other auto manufacturer, from 1931 to 2007. In 2008 Toyota overtook them in world sales.

In 2006 GM refused to sell its 20% stake in Renault as suggested by Kirk Kerkorian, an investor. So Kerkorian sold his huge stake in GM. GM's stock fell to under \$1 in 2009.

As with Chrysler, the US government's TARP program bailed out GM in 2009. GM Corporation declared chapter 11 bankruptcy, sold off Saab, and reorganized as GM Company. TARP gave them \$49.5 billion. GM shareholders lost everything, but the new GM paid back \$39 billion to TARP. Experts say that though this financial legerdemain cost \$10 billion, it saved 1.2 million jobs and preserved \$35 billion of tax revenues to the government.

Today GM still manufactures cars and trucks in 35 different countries with a market capitalization of \$47 billion (Ford is \$37 billion). Its four marques are Chevrolet, Buick, Cadillac and GMC trucks. The suburban is its longest lasting model from 1935 to present. GM employs 212,000 people doing business as GM North America, GM South America, GM International Operations, and GM Financial. In 2017 GM sold 9.6 million vehicles including 3 million in the US.

In 2014 media exposed GM's cover-up of faulty ignition switches causing 120 deaths over a decade. Mary Barra, CEO, handled the scandal well and sales increased. I suspect that had it been a man in charge, the matter could well have lingered on too long, impairing sales further. In 2017 GM sold Opel to PSA Group (a French conglomerate).

As an afterthought, Tesla struggled to produce 367,500 cars in 2019 (3% of GM's 9 million), but is capitalized at \$80 billion greater than GM at \$52 billion!



Chevy Corvette 1967. The Corvette is probably GM's most iconic automobile produced from 1953 to the present.

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#11. American Railway Signal. 25 shares of stock to H.P Nickels, dated May 1883. Possibly an early precursor of General Railway Signal. GRS was formed in 1904 by a merger of Pneumatic Signal Company of Rochester, NY; Taylor Signal Company of Buffalo NY; and Federal Signal Company of Albany, NY. Each of these companies in turn came from multiple other companies. #2904

General Railway Signal (GRS) is the only historical DJIA company, whose stock certificate I do not have. Instead, I show an earlier railway signal company. A merger of three railway signal companies (each formed from mergers of multiple companies) formed General Railway Signal.

When you compare a little-thought-of industry like railway signaling with Ford, most people are surprised Ford was never in the DJIA. But GRS (who the hell are they?!) was in the DJIA. GRS was in the new DJIA 30 in 1928 where it stayed for two years until Ligett & Meyers displaced it.

The first railroads were the Baltimore and Ohio in the US and the Liverpool and Manchester in England in 1830. The period of fastest track growth in the US was between 1865 and 1930. US track peaked at 410,634 miles in 1930. By 1969 track fell to 339,000 miles. However, ton-miles per year had quadrupled because they managed the track more efficiently. Faster, mightier engines helped. But US railroad signaling, which started in 1837 played a major part.

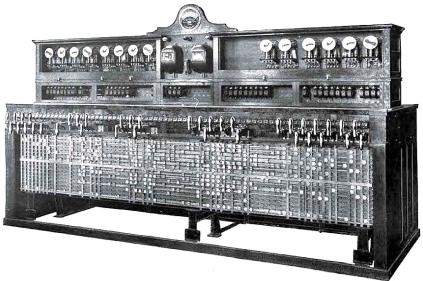


Direct mechanical interlocking, first installed in US in Trenton NJ 1870.

The first innovation was mechanical interlocking, which used large levers to operate switches through pipe connections. The first such installation was in 1870 in Trenton, NJ. Mechanical interlocking simply used the brute force of the signalman to raise and lower semaphore arms by direct mechanical action.

In 1890 Dr. McCartney formed the Auto-Pneumatic Railway Signal Company in Rochester, NY, using low-pressure pneumatic switches. They called this pneumatic interlocking and installed it at Grand Central Station in New York City in 1900. The *History of GRS* shows a picture opposite of mechanical interlocking.

John D. Taylor invented an all-electric interlocking system and started the Taylor Switch and Signal Company in 1889. He installed it first at the crossing between two lines: the Baltimore and Ohio Railroad Southwestern line and the Cincinnati Railroad. Below is an example of an early electrical interlocking system.



GRS Model 2 interlocking machine in 1915

In 1965 GRS formed another company, GRX, intending to diversify out of railway signaling, with GRS being just one division. In 1989 Sasib Railways Group from Italy bought them out, and in 1998 Alstrom bought out Sasib.

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Cox lists 7,152 distinct varieties of certificate, Fuld lists around 6,800, and Stahlberg lists approximately 2,400 US and 1,400 foreign certificates. But this does not mean that no certificates exist of GRS, Pneumatic Signal, Taylor Signal or Federal Signal.

Although autos and trucks grew significantly after the First World War, in the 1920s, the railroads to this day still carry more freight than trucks! In 2013, based on ton-miles of cargo, US railroads carried 44.5% of freight, trucks 38.1%, and ships and planes carried the rest.

It was not until 1930 that 50% of families owned an automobile. However, there were no interstate highways. Congress enacted laws to create the interstate highway system in 1956. 1990 saw the final completion of the interstate system. Only with this was interstate container trucking feasible.

	1960	1970	1980	1990	2000	2010	2016
Air	31	108	191	346	516	576	670
Auto	1,145	1,751	2,012	2,281	3,108	2,816	3,045
Bus	?	?	?90	121	314	292	347
Commuter Rail	4	5	7	7	9	11	12
Intercity Rail	17	6	5	6	6	6	7

Billions of US Passenger miles a year, from US Bureau of Transportation Statistics.

This table shows clearly that automobile passenger transportation now dwarfs rail passenger transportation. The table opposite shows a million autos registered before the First World War (1914-1918). It shot up to 8 million in 1920 and 23 million in 1930 when 50% of families owned an auto. The US population was 106 million in 1920 and 123 million in 1930. It also shows five autos per truck in 1956, and 1.8 autos per truck in 1995, showing how trucking expanded to take advantage of the interstate highway system.

Railway travel is now quite safe - much safer than auto transport. It was computerized trafficking equipment that made it so. But in the early days of rail travel accidents were common. Some people refused to travel by rail because of it. But with signaling devices, travel became safer.

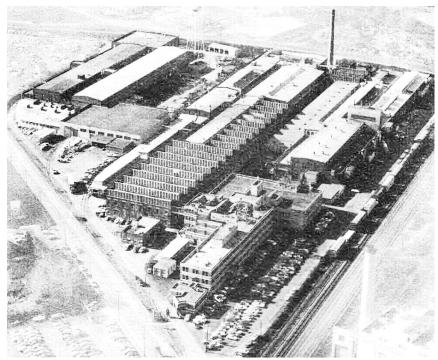
The following list taken from quora.com shows the chances of death per billion miles traveled today:

- Air 0.08
- Bus 0.6
- Rail 1
- Van 2
- Automobile 5
- Bicycle 71
- Pedestrian 87
- Motorcycle 175

1	) ('11'	Million
Millions		
1000	Autos	Trucks
1900	0.008	
1901	0.015	
1902	0.023	
1903	0.033	
1904	0.055	0.0007
1905	0.077	0.001
1906	0.1	0.002
1907	0.14	0.003
1908	0.195	0.004
1909	0.306	0.006
1910	0.458	0.01
1911	0.619	0.02
1912	0.901	0.04
1913	1.2	0.07
1914	1.6	0.1
1915	2.3	0.16
1916	3.4	0.25
1917	4.7	0.4
1918	5.5	0.6
1919	6.7	9
1920	8.1	1.1
1921	9.2	1.3
1922	10.7	1.6
1923	13.3	1.8
1924	15.4	2.2
1925	17.5	2.6
1926	19.3	2.9
1927	20.2	3.1
1928	21.3	3.3
1929	23.1	3.5
1930	23	3.7
1931	22.4	3.7
1932	20.9	3.5
1933	20.6	3.5
1934	21.5	3.7
1935	22.6	3.9
1936	24.0	4.3
1937	25.5	4.5
1938	25.3	4.5
1939	26.2	4.7
1940	27.5	4.7
1941	29.6	5.2
1941	27.9	1.0
1042	21.9	4.7
1943 1944	26 25.6	4.9 4.7 4.8
1045	25.0	5.1
1945	25.8 28.2	
1946		6.8
1947	31	0.8

	Millions	Million
	Autos	
1948	33	Trucks 7.5
1949	36	8
1950	40	8 8.6
1951	43	9
1951 1952	43 44	9 9.2
1053	46	9.5
1954 1955 1956 1957	48 52 57	9.8
1955	52	10
1956	57	11
1957	56	11
1958 1959	56 57 59 62	11 12 12
1959	59	12
1960	62	12
1961	0.5	12
1962 1963	66	13
1963	66 69 72	13 13 14 15 15 13 14
1964	72	14
1965	75 78	15
1966 1967	78	15
1967	80	13
1968	84	14
1969	87	17
1970 1971 1972	87 89 93	17 19
1971	93	20
1972	97	21
1973	102 105	23
1974 1975	105	25
1975	107	26
1976	110	28
1977	112	29
1978 1979	116	31 33
19/9	118	33
1980	122 123 124	34
1981 1982	123	35 35
1982	124	35
1983	126	37
1984 1985	128 128 130	12
1985	120	43 45
1986	131	43
1988	134	50
1989	135	
1990	134	52 55
1990	128	59
1992	127	63
1993	128 127 127	66
1994	128	69
1995	128	72
Industrial Action	120	120-

Auto and truck registrations in US in millions from 1900 to 1995.



GRS plant in Rochester, NY? 1950s.

Before the 1850s, trains traveling in opposite directions on a single track relied on prearranged timing to enter sidings. After the 1850s, dispatchers telegraphed local stations using Morse code about which train was where. Local stations would tell trains that passed through what to do. Later, they used signals. Recall that before Westinghouse invented air brakes in 1872, it could take up to two miles for a train to stop.

Block signaling started in 1832. They used suspended balls, which they could cover with a sock. They placed the balls three miles apart, and a telescope was needed to see them.

Later, if several trains were travelling in the same direction on a single track, they used automated block signals (ABS). This meant several signals linked together to prevent rear-end collisions.

In 1872 Dr. William Robinson invented closed-track circuit signals, which became the basis of AC circuit signals. GRS installed the first two-position semaphore signals called Model 3 on the Union Pacific Railroad in 1906.

Later, if a train entered a single track, the dispatcher would set all signals on the track to prevent locomotives entering from the opposite direction. GRS invented this system, which they called APB (absolute permissive block).

They installed it first on the Toronto, Hamilton and Buffalo Railroad in 1911. This used complete siding-to-siding protection and signal-to-signal protection for opposing rail traffic. They later incorporated APB into "CTC" (more about that later).

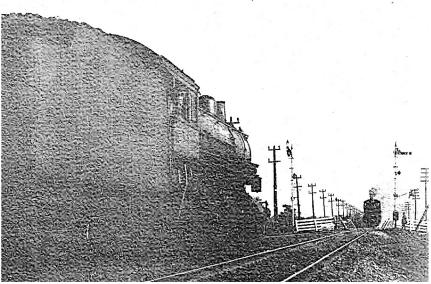


Photo of the world's first "meet" on APB installation in 1911.

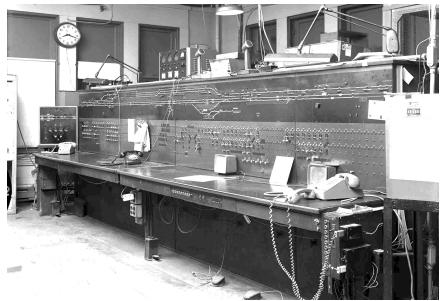
In 1905 GRS installed the first highway-crossing gate using semaphore signal motor drives to open and close gates.

During the First World War (1914 - 1918) GRS made 80,000 artillery shells, and small gasoline engines for bicycles. Because of the downturn in the signal business they made electric clothes washers between 1920 and 1926.

GRS invented centralized traffic control (CTC), which it first installed in 1927 on a 40-mile stretch of the New York Central Railroad in Ohio. This consolidated train routing decisions, previously made by local signal operators or train crews. CTC was like modern day air traffic control towers.

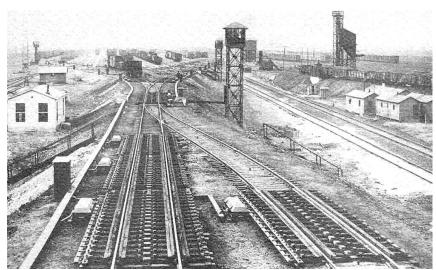
The system included a central control panel with a graphic display of rails. The Dispatchers could keep track of where trains were, what direction they were going in and what all the signals said. They could now bypass local operators or written orders. They sent the signals by wires using a pulse code system.

Of course, today we would say, just use a computer! But GRS had no computers in the early 1900s and they had to invent fail-safe mechanisms relying on mechanical and electronic devices monitored by dispatchers.



Providence, RI, CTC panel installed 1946 by competitor United Switch & Signal before the days of computers, note electronic track display above.

If a signal moved by electric current, they called it electronic interlocking. In 1929 GRS started the first all-relay electronic interlocking system. Signaling first used semaphore arm signals controlled by electric current and switches controlled by relays. A relay may work electronically or electromechanically using a solenoid. Naturally they could make groups of signals work together automatically.



GRS first electric car retarders installation on Illinois Central 1926

During the Second World War (1939-1945) GRS made millions of artillery shells, and remote-control B-29 bomber turrets. They also made remote-control prison cell door openers for federal prisons. In 1941 they got into air traffic control.

In 1953 GRS used transistors in their signal systems and in 1973 they installed Automatic Train Control for the first time for cab signals. Automatic Train Control used inductive train brakes, also invented by GRS.

In 1950 GRS used automated switching at the Markham Yard, Illinois Central Railroad. In 1962 they installed the first crewless trains. In the 1960s they installed computerized traffic control systems for traffic lights in cities.

In 1968 they used the first digital computer at Perlman Yard on the New York Central Railroad.

In 1960 GRS opened a division in Argentina, and in 1986 partnered with China to form the China American Signal Corporation (CASCO). GRS's manufacturing plant was in Rochester, NY until 1993. After 1998 they consolidated their facilities in West Henrietta, 14 miles from Rochester.

In summary this was information technology before information technology existed! It was used as an application for railroad systems automation. GRS markedly increased safety. And just as computerized airfare systems have revolutionized air travel today, GRS revolutionized railroad operations management. It made rail travel much safer, and allowed a quadrupling of cargo carried.

GRS was in the new DJIA 30 in 1928, where it stayed for only two years.

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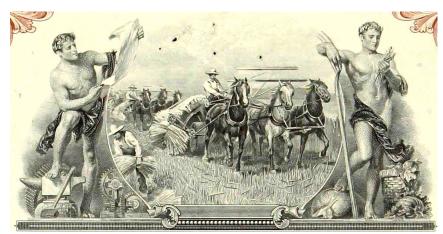
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General Railway signal. History of General Railway Signal Company. 1979



#13. International Harvester \$1,000 15 year 4.8% debenture payable to Cede & Co. dated March 1975. (A bond is secured by assets; a debenture is unsecured). Hole cancelled with a rolling puncher. The seal shows incorporation in Delaware in 1965. ABNCo printed the certificate.

#1957.



International Harvester vignette showing the McCormick Reaper.



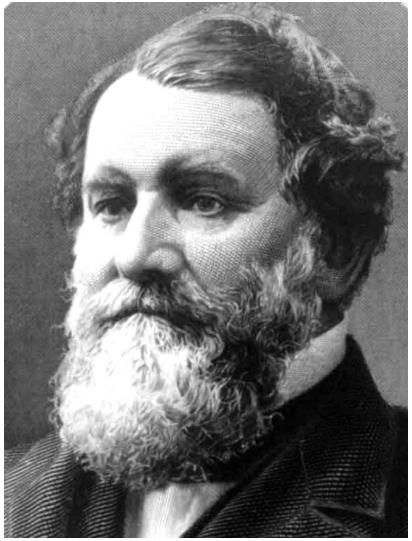
Farm vignette by Marcus Baldwin on back of \$10 Federal Reserve Note. #996

In 1831 Cyrus McCormick launched his reaper. This was the first machine to harvest grain mechanically, which he patented in 1834. In 1837 McCormick started the McCormick Harvesting Machine Co. with his partner Charles Gray. Hiram Moore first invented the combine harvester in 1838. Both the above vignettes show the McCormick reaper drawn by a team of three horses. Even in 1914 54% of the US population still lived in the country. Farming was huge. That year it still took an hour of labor without a reaper to harvest enough grain to make ten loaves of bread.

The mid-west was growing in the mid-1800s and Chicago became its rail center. McCormick located in Chicago, used a large professional sales force, and distributed his machines by rail from Chicago. By 1855 he was producing over 2,500 reapers a year, making \$300,000 a year. The Chicago factory burnt down in the Great Chicago Fire of 1871. McCormick then built a larger facility employing 800 men with annual sales over \$1 million.

Cyrus died in 1884 aged 75. His wife and son took over. His son, Cyrus McCormick Jr., was hostile to unions and labor. Workers at that time worked 10

hours a day six days a week and were paid around \$1.50 a day. Labor tried to organize. But employers used blacklisting, firing, lockouts, strikebreakers, spies and private detectives, and they promoted ethnic strife.



Amazing Engraving (not a photograph) of Cyrus McCormick 1809 – 1884.

In the mid-1800s a political philosophy called anarchism began to influence labor movements in the US. In the early 1800s, 80% of people were self-employed. But after the Civil War, industrialists with access to money employed more and more people. Workers could no longer be self-sufficient.

In 1800 6% of US population lived in cities, in 1860 20%, in 1900 40%, in 1950 60%, and in 2000 80%.

This sparked antagonism between capitalists and labor. Henry David Thoreau (1817-1862) and others pushed for self-sufficiency and no taxes. Many in the labor movement espoused anarchism. From 1873 to 1879 there was a general recession (the "Panic of 1873") further exacerbating labor's woes.

In 1884 the Federation of Organized Trades and Labor Unions decided that by May 1<sup>st</sup>, 1886 labor would work only eight hours a day. That year the Union prepared for a general strike. On May 4<sup>th</sup>, thousands of workers assembled peacefully in Haymarket Square in Chicago to protest the police killing several McCormick strikers. Suddenly a bomb was thrown at the Chicago police. By the end of the day, seven policemen and three civilians lay dead in the street and many others were wounded. In 1888 seven of the anarchists involved were sentenced to death.



1886 Harper's Magazine depiction of Haymarket rioters bombing Chicago Police.

William Deering was a rival harvester manufacturer from Plano, Illinois, who moved to Chicago in 1880. By 1890 McCormick's plant employed 5,000 men and Deering's 7,000 and the two companies discussed merging.

In 1902 J.P. Morgan (who else?) merged McCormick's and Deering's companies and three others capitalized at \$120 million to form the International Harvester Company (IH). In 1915 they offered their first combine harvester. Ten years later they offered their first tractor drawn combine harvester ("combine"). After that, combines took off. Combines were so called because they combined the tasks of harvesting, threshing, and cleaning grains.

In 1907 IH made their first truck. They called it a Model A Auto Wagon, and renamed it the IH Motor Truck in 1910, and the International Truck in 1914. These trucks would later evolve into a line of pickup trucks including the International Scout and large trucks.



1911 one cylinder 25 hp Mogul tractor by International Harvester.



1911 International harvester Auto Wagon – first IH truck, note flatbed.

By 1910 IH sold \$100 million of equipment a year employing 17,000 people with plants in US, Sweden, Russia and Germany. They made tractors, trucks and agricultural machinery. They then focused on making large tractors to pull large plows and combines. They made the first tractors called "Moguls" from 1911 to 1914. In 1915, they introduced the "10-20" and "15-30" tractors which could pull large plows and had a belt power take-off for threshing machines.

In 1919 IH bought the plow manufacturer Parlin and Orendorff. Five years later, they introduced a much smaller "Farmall" tractor to compete with Ford's Fordson tractors. Two years later they opened a new plant in Rock Island, Illinois, to make Farmall tractors. By 1930 they had sold 100,000 Farmall tractors. The line continued to 1973. They sold 5 million Farmall tractors. What a great name too!

In 1932 they introduced the first diesel tractor, which in cold climates could be warmed up with gasoline, then run on diesel fuel. In 1939 the famous designer Raymond Loewy made sleek designs for their tractor line so they sold very well.

Loewy designed the Coldspot refrigerator for Sears-Roebuck around 1930. This catapulted him to prominence as an industrial designer. After designing locomotives for Baldwins, he worked at Studebaker, then at NASA.

During the Second World War (1939-1945) IH ranked 33<sup>rd</sup> in wartime production. After the war in 1946 they bought an old Curtiss Wright aircraft factory in Louisville, KY. They expanded tractor manufacturing introducing the "Cub Farmall" for very small farms, which became very popular. In 1955 they introduced the "hundred series" tractors, which had line-ups and design changes just like the auto industry. But, in 1958 a huge tractor recall made many farmers switch to Deere tractors. IH also started an Australian subsidiary in the 1950s.

IH's high point was 1940 to 1960. In the 1950s revenues were over \$1 billion a year. In the 1960s they added cabs and hydrostatic transmissions. Hydrostatic transmissions use hydraulic fluid rather than cogwheels or belts to drive wheels and are continuously variable. (Hydrostatic transmissions are not used on automobiles because they are only really efficient at transmitting high torque at low speed). In the 1970s they added rollover protection, air conditioning, heat and radios. In the 1960s IH made Cub Cadet lawn mowers for homeowners.

But in the 1970s rigid management and poor innovation led to falling profits. They hired a new CEO, Archie McCardell, who reorganized IH making the highest profit for ten years. But just then the economy tanked and IH had a crippling UAW strike for six months, which was the kiss of death. When the strike was over IH had lost \$600 million - a loss they never recovered from.

IH then started selling off various divisions. In 1981 they sold off Cub Cadet to MTD products. Three years later they sold their IH name and tractor division to Tenneco Inc. who merged it with their subsidiary Case, now owned by Fiat. This included their combine harvesters, cotton pickers, tillage equipment, etc.

Their heavy truck division had been making large trucks since 1962. In 1986 they changed their truck division name to Navistar International Corporation, who live on, still manufacturing large trucks, buses and engines. IH sold their construction equipment to Dresser, who became Komatsu in 1994. They sold another division, IH Solar, to Caterpillar who still build industrial gas turbines.

I always used to wonder why some old tractors had the two front wheels close together, like a tricycle. The early days of tractors saw all sorts of combinations. After all, these were the early days of experimentation. They called them tractors because they had high power at low speed, primarily designed for traction to till fields, pull plows and plant row crops. Row crops required short turns at row ends when cultivating. The narrow front wheels allowed the tractor to make tight turns. But as time went on tractors were used to plow, cultivate, pull reapers, power belt-driven equipment, mow, rake and pull wagons. Stability became more important because of rollover accidents. Tricycle style tractors became a thing of the past.

IH had a good innings, lasting 70 years under the McCormicks and 80 years as IH, they made tractors, small trucks, heavy trucks and agricultural machinery. IH was in the DJIA from 1924 to 1985. The story by now sounds familiar, a once huge industry after a number of years declines then splits up selling off various divisions. Companies are like people and empires: they have a beginning, a heyday and an end. Rome did not last forever. Neither did IH!



IH Farmall D430 tractor, built originally for row crop work was affordable for small family farms and could reduce the need for hired hands and horses, they dominated the market 1920-1970.



IH Scout 1961-5. International Scout lasted 1960-1980, initially the only 4WD pick up and SUV except the Jeep. A precursor of the SUV.



The only part of IH that lives on – Navistar International trucks, here a CE300 school bus built on an International chassis. International still command 11% of the US heavy truck market, behind Freightliner (40%), Kenworth (14%), and Peterbilt (13%).



IH produced the International Harvester Payhauler 1956-2003. This line became a separate company in 1982 called Payhauler Corporation. IH's 1964 Payhauler could hold 45 tons of material, the first large, all-wheel-drive rear dump truck on the market. In 1982 IH sold Payhauler to employees who later sold it to Terex in 1998. Terex now makes these incredible mega-trucks.

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#14. International Nickel Company 100 shares of preferred stock par value \$25, issued to J.S. Bache & Co. in April 1925. They confusingly refer to it as Common Capital Stock, but in the text, it says it is preferred stock and lists the par value.

The company was incorporated in New Jersey. ABNCo engraved the certificate. The certificate is punch cancelled twice, the left reads CANCELED | 10.28.25 | GT Co. The right reads CANCELED | 10.27.25 | BT CO. (Americans prefer "canceled" with one I, whereas British prefer "cancelled" with two I's. Both are correct!)



Vignette on International Nickel certificate shows reclining helmeted female holding oak branch in right hand, lion and torch at left, and book entitled

The International Nickel Company.

The oak branch symbolizes strength and independence and the torch symbolizes enlightenment and hope, life, truth and the regenerative power of flame. The lion conveys strength. One might call the female the allegory of strength, power and hope. The engraver is unknown.

Nickel was first isolated chemically in 1751. It is the earth's fifth most abundant element. Until 1890 most of the world's nickel came from the "Le Nickel" Rothschild mine on New Caledonia, an island off Australia. Early on the only use of nickel was for coins. But in 1889 they showed it strengthened steel and used it to make armor plate for warships, tanks and military vehicles. Since then they have discovered other uses including other steels, batteries, electronics, architectural metal and magnets.

The largest nickel discovery in the world was in Sudbury, Ontario, Canada where it is thought a meteorite struck the earth eons ago. Nickel comes in two forms: nickel sulfide deposits and iron-nickel "laterite" deposits. It is easy to extract nickel from nickel sulfide, but expensive to extract nickel from laterite deposits.

They used to extract nickel sulfide using froth flotation (just like the Utah Copper Company method) and later, because nickel is weakly magnetic, by magnetic extraction techniques. Lateritic ores are usually smelted into a combination of iron and nickel used in nickel steel. Today around 65% of nickel produced is used in steel alloys. Today 23 countries mine nickel and 25 countries smelt nickel. The main mines are in Canada, Russia, Australia and Indonesia.

S. J. Ritchie founded the Canadian Copper Company in 1886 after finding copper deposits in Sudbury. They found the Sudbury ore very rich in nickel

sulfide. He shipped the ore to a New Jersey smelting plant belonging to the Orford Copper Company of Constable Hook, NJ. They were located on the Jersey City peninsula formed by the lower Hudson River and Newark Bay.

The US steel industry was uncomfortable relying on a single Canadian source of nickel. So, in 1902 Charles Schwab, US Steel President, got J.P. Morgan to arrange a merger of Orford and Canadian Copper to form the International Nickel Company (INCO), based in New York. Ownership then became American. INCO controlled 70% of the US nickel market in 1913.

As INCO had a US monopoly, they could easily use price wars to defeat competitors. In 1923 INCO decreased the nickel price from  $34 \, \epsilon/\text{lb}$ . to  $25 \epsilon/\text{lb}$ . to drive the competing British American Nickel Company into bankruptcy. INCO then bought out their equipment and inventories for a song using a dummy company.

In 1916 INCO transferred their headquarters to Sudbury in Canada. They formed INCO of Canada Inc. a subsidiary of US based INCO. In 1919 they officially called themselves INCO rather than International Nickel Company.

Demand was heavy during the First World War (1914-1918). But after disarmament, INCO had a huge backlog of nickel. Sales plummeted, and they posted a \$1.2 million loss in 1922. They shut the Sudbury mine for six months.

In 1922 Robert Crooks Stanley (1875-1951), a metallurgist and the grandfather of the Nickel industry, started as INCO President, and later became Chairman for over 30 years. He vowed to find other uses of nickel to avoid great swings of demand. He funded a metallurgical research department that discovered Monel. This is an alloy of 70% nickel, 25% copper and other metals, which was stronger than steel and did not corrode. Monel was used extensively in architecture. In the late 1920s INCO built a Monel rolling mill in Huntington WV. In the 1940s stainless steel largely replaced monel. Modern stainless steel is rust resistant because of nickel, manganese and molybdenum. Rustproof steel has a protective layer of chromium oxide on the steel surface.

In 1928 INCO bought out Mond Nickel Company who owned 50% of Sudbury's nickel mines and merged with them to form International Nickel Company of Canada Ltd. Ludwig Mond was an English chemist who founded the famous English Imperial Chemical Industries (ICI). INCO moved ownership of Mond to their UK subsidiary to prevent US antitrust suits. In 1928 INCO became part of the new DJIA 30.

The Great Depression saw a temporary decrease in profits but INCO was by then the world's sixth largest copper producer, and the world's largest platinum producer. INCO now had a non-communist monopoly of 90% of world nickel. They found new uses for nickel steel - gun recoil systems, exhaust systems and exhaust valves on aircraft engines.

In the mid-1930s INCO signed a long-term contract with Germany's I.G. Farben to supply them with nickel. These unpatriotic nickel sales to Germany during the Second World War caused ill feeling. In 1948 the US Department of Justice sued INCO for its monopoly, pointing out that the price of nickel had been flat from 1928 to 1946.

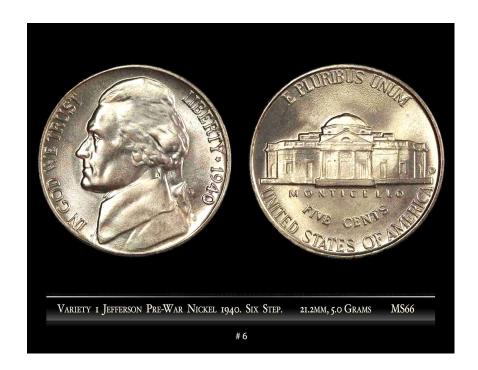
INCO agreed to sell its nickel only in the US. But of course, INCO's UK subsidiary was free to sell again to Germany or anyone else! Because INCO nearly went bankrupt with stockpiles of nickel, which decreased in price after the First World War, INCO Chairman Stanley refused to stockpile nickel during the Second World War.

During the Second World War (1939-1945) they continued to make US nickels ( $5\phi$  coins) as usual since 1886 of 25% nickel and 75% copper. However, they needed nickel for armor plate steel. So, from 1942 to 1945 they changed the composition of the five-cent nickel. It became 56% copper, 35% silver and 9% manganese. Today a "war nickel" contains  $80\phi$  of silver in one nickel! The images opposite show a pre-war and war nickel.

After the Second World War they needed nickel for steel for autos, sinks, white goods and jet engines. During the Korean War (1950-1953), INCO could not produce enough nickel for steel. So the US government added nickel to its list of stockpiled critical metals and INCO was forced to supply it. The government also financed alternative suppliers when the price rose 60% from 1946 to 1950. INCO's percentage of the world's supply dropped from 85% in 1950 to 34% in the 1990s. US Steel had been happy to have a stable priced nickel for almost 40 years in US.



Sudbury "Numismatic Park" started 1951 by local resident showing 30' nickel.





In 1954 INCO built the world's tallest chimney at Sudbury 637' high. In 1972 they again erected the world's tallest chimney in Sudbury's Copper Cliff smelter called the INCO super stack measuring 1,250'. This of course did not decrease pollution, but it simply spread it out over a greater land area! The same dirty old trick Utah Copper had played for decades!



Sudbury's 1,250' smokestack built in 1972 to spread the sulfur dioxide further!

John Thompson the INCO Chairman realized that the post-war nickel shortage demanded increased supplies. So he hunted for a new source, which he found in 1956 in Manitoba, called the "Thompson field". INCO spent \$175 million making mines, smelters, housing and a railroad connection. Nickel sales increased 30%.

In 1965 they made \$136 million profit. New uses were found in electronics and aerospace, which expanded nickel's demand. The Vietnam War (1955-1975) increased nickel demand again so INCO borrowed \$1 billion to expand facilities. But in 1969, 17,000 Sudbury workers struck and in 1971 a recession hit. INCO stock fell 50%.

The next CEO reduced labor and reduced production capacity to 80% in Canada. But he caught acquisition fever. He invested \$750 million in laterite ferronickel mines in Indonesia and Guatemala. By 1974 INCO supplied only 50% of the word's nickel. He thought INCO should "diversify" (read acquisition fever!). So he bought ESB, a producer of nickel-based batteries, saying it would help to balance cyclical downturns. Nickel metal hydride and nickel-cadmium batteries used to be state-of-the art, but electric cars now run mainly on lithium-ion batteries.

INCO's laterite mines in Indonesia ad Guatemala turned out to be a problem. They found laterite nickel costlier to extract and oil-dependent. So, with an escalation in oil price from 1973 to 1980 it made laterite derived nickel too costly to produce.

In 1976 INCO of Canada changed its name to INCO Ltd. They had debts of \$850 million, which they could not refinance because interest rates were sky

high in the early 1980s. They had also not invested in battery research so sales slowed. After the CEO's bout of acquisition fever, he recovered and wrote off their battery division, ESB, for \$245 million and sold the impotent Guatemala mine!

INCO then focused on their core business, the Sudbury nickel sulfide deposits, and developed new extraction techniques using less labor. After several years of losses, they finally made a \$125 million profit in 1987. The next year their profit was \$735 million.

INCO CEO Phillips once bitten was twice shy. Weary of "diversification", he gave a \$10 per share cash dividend, and tried to re-capitalize the business. But environmental issues were looming. Sudbury was the largest sulfur dioxide polluter in North America. Abatement would be expensive.

In the 1990s nickel prices dropped because of Russian competition and in 1992 INCO only made \$18 million profit on sales of \$2.65 billion. So INCO sold its stake in TVX Gold Inc. and closed facilities. The next year they expanded on one of their low cost Indonesian mines. When 4,900 laborers announced their intention to strike in Sudbury, INCO funded more research into automation and nickel applications. That automation became tele-mining, using surface remote control of machinery down in the mines.

In 1997 Sudbury workers finally went on strike. Meanwhile Russia and Australia produced cheap nickel. INCO formed a marketing group to exploit specialized nickels, and a new division in 2000 for nickel foams, powders, oxide particles and fibers used in batteries and electronics. They also promised to develop a nickel and cobalt mine in New Caledonia, an island off Australia. INCO survived.



Voisey's Bay open pit mine in Canadian province of Newfoundland and Labrador.

In 1996 they bought Voisey's Bay mine in North Labrador for \$4.5 billion, partly financed by stock. This promised to be a huge nickel mine. But Voisey's Bay became a quagmire. The government demanded environmental studies before any mines were dug. Further, the government demanded that refining be done only in Labrador. Inuit groups objected. After eight years of this headache, INCO announced a "statement of principles".

Mining finally started in 2005. Wouldn't you know! The next year, miners went on strike to get the same pay as workers in Sudbury! Then workers at Sudbury and Thompson then threatened to strike if the ore was not sent to their facilities to preserve their jobs! Eventually Sudbury and Thompson workers accepted a compromise: INCO would ship the ore to Sudbury until 2011 then would be smelted in Newfoundland. The Newfoundland smelter construction started in 2009 and the plant finally started operations in 2014.

In 2006 Brazil's Vale announced a \$19.4 billion takeover of INCO. They were the world's second largest nickel producer and third largest platinum producer at the time. Shareholders approved, and they became Vale SA in 2009.

### What is SA?

Stock certificate collectors (scripophilists) know that many European certificates have the letters SA after the company. SA stands for Société Anonyme in French (they use the same letters in Spain, Italy, Poland and Portugal). It means anonymous company as opposed to a partnership or limited liability company. The equivalent of SA in the US is a corporation; in England it is plc; and in Germany it is AG. It means the business structure is a legal entity, which can buy, sell, sign contracts and accept liability while limiting the owner's personal liability. See the beautiful stock certificate opposite with Société Anonyme spelled out below the lady's wand.

Vale now operates as the world's largest nickel and iron ore producer, as well as other mined products like manganese, coal and copper. Profits in 2017 were \$1.6 billion on revenues of \$34 billion and they employed 73,596 people. INCO was in the DJIA 30 from 1928 to 1975.

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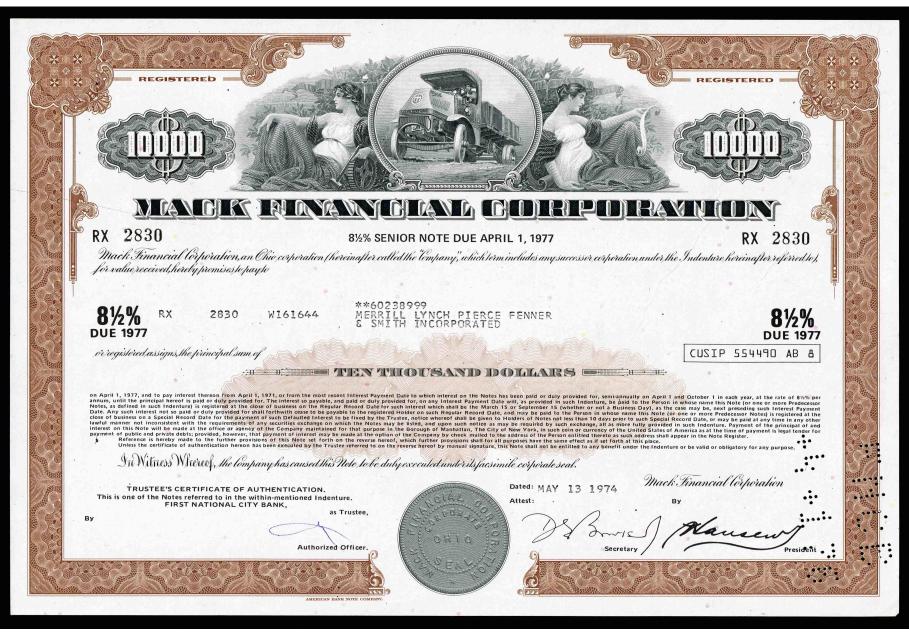
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Bruges, Belgium, Stock Certificate. Note Société Anonyme (meaning anonymous company) below lady's wand.

SA means the same as a corporation in the US.



#15. Mack Financial Corporation 8½% 3-year \$10,000 bond to Merrill Lynch dated May 1974. Punch cancelled FNCB | +4 + 1 75.

Mack Financial was incorporated in Ohio, and ABNCo printed the certificate. # 1968.



Vignette of Mack Truck "The Bulldog" from the early days.

In 1890 John Mack got a job at Fallesen and Berry, a small carriage and wagon manufacturer in Brooklyn, NY. Three years later he and his brother, Gus (short for Augustus) bought out Fallesen and Berry. The next year another brother, William, joined them. They then focused on wagons rather than carriages.



Early Mack bus at Allentown Museum, note open body, in 1919 90% of automobiles were open bodies. In 1929 90% were closed bodies.

In 1900, they opened a bus manufacturing plant and called it Mack Brothers Company. Five years later, they established the Mack Brothers Motor Car Company in Allentown, PA. They were one of the first manufacturers to mount the cab over the engine for improved visibility. Mack Headquarters remained at Allentown till 2009.

In 1906 they changed the name of their company in Brooklyn, NY, to Mack Brothers Manufacturing Company. They produced their first truck in 1907, and two years later introduced the "Junior" line, a 1½-ton truck. This was the old terminology. It did not refer to the weight of the truck; it meant it could haul 1½

tons. Modern terminology uses GVWR (Gross Vehicle Weight Rating). This is the weight of the vehicle fully laden with cargo in lbs. A  $1\frac{1}{2}$ -ton truck then is today equivalent to 14,000-16,000 GVWR. There are 2,000 lbs. in a US ton. Thus, a fully laden  $1\frac{1}{2}$ -ton truck today weighs 7 to 8 tons.

In 1911, the Mack brothers sold out to the International Motor Company, which became a holding company for their two companies. They also bought the Saurer Motor Company and the next year, the Hewitt Motor Company. One of International Motor Company's specialties became fire trucks.

Although Mack Trucks were part of International Motor Company, they were still a company in their own right. In 1914 they produced their first standardized high-volume model called the Mack AB. They made it with either a chain drive or a worm gear drive for increased traction.

In 1916 Mack's holding company changed its name again to International Motor Truck Corporation with plants in Brooklyn, NY, Allentown, PA, and another in Plainfield, NJ. Mack started the AC model, which continued till 1939. They made 40,000 of them. It gave Mack its reliable reputation like a bulldog. The slanting front to the truck was iconic.



Mack AC truck with iconic slant nose front, hauling Hale 100" mirror for Mount Wilson Observatory up Mount Wilson in 1917.

Note M emblem on front, and sprocket chain drive underneath.

In 1918 Mack installed the first air and oil filters in trucks. Two years later they added power brakes with a vacuum booster system and rubber chassis cushions.

In 1922 they changed their name to Mack Trucks Inc. Their main competitor was International Harvester. And they did not want people to confuse their holding company's name International Motor, with International Harvester.

They adopted the English bulldog eating a book labelled "Hauling Costs" as their corporate symbol. This later changed to a bulldog hood ornament with the word MACK below on the grille.



Old Mack logo pre 1922.

Modern hood ornament.

In 1927 Mack made the BB and BJ models – 15,000 of them from 1927 to 1941. In 1929 they produced their first semi models that continued till 1944. Some early models could not reverse, they had to unhitch the trailer and go around to the other end!

In 1936 Mack Trucks Inc. yet again changed their name to Mack Manufacturing Corporation. Mack introduced their E series of trucks that carried up to 10 tons, with cab-over and cab-behind styles. They made 78,000 of these from 1936 to 1951. Mack was the first to launch four-wheel brakes for heavy-duty trucks. In 1938 they made their first diesels. Additionally, from 1936 to 1972 they made off-highway trucks also called mine trucks. These had a 15-ton to 100-ton cargo capacity!

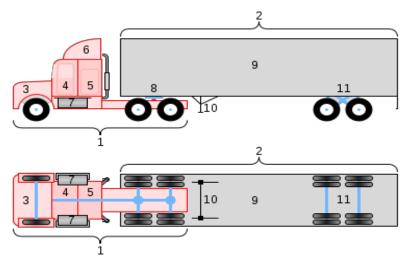
During the First and Second World Wars veterans came to learn and appreciate the reliability and power of Mack trucks. During the Second World War Mack made 35,000 military trucks, mainly L models. From 1940 to 1953 they also started making marine engines. From 1953 to 1962 they made 128,000 B model trucks.

In 1962 they introduced the all-steel sleeper and non-sleeper cab semis. Obviously, if you had a short-haul truck you did not want a sleep-behind cab. But, if you wanted a long-haul semi that was going to be driving two thousand mile stretches, a sleeper behind the cab was important.

In 1967 Mack was taken over by Signal Oil and Gas Company, which later became The Signal Companies Inc. That year they introduced their Maxidine diesel, which produced maximum horsepower over wider speed, ranges than any other diesel. Two years later Mack pioneered and patented cab air suspension for ride comfort. In 1974 they started their "Cruiseliner" a premium cab-over semi that continued for 10 years. The "Superliner", the ultimate driver luxury for heavy-duty hauling started three years later and lasted 17 years.



Modern Mack "Pinnacle" semi, hauling a large Christmas tree.



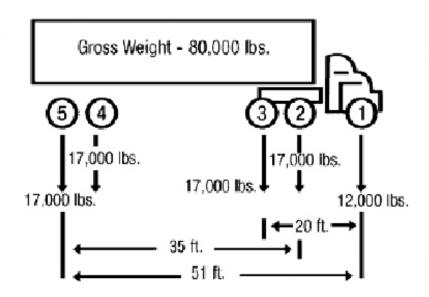
Wheel layout of modern semi showing 18 wheels on 5 axles.

1=tractor, 2=trailer, 3=engine, 4= cab, 5=sleeper, 6= aerodynamic roof,
7=fuel tanks, 8=5<sup>th</sup>wheel coupling, 9=container, 10=landing gear, 11=axles.

A tractor-trailer is also called a semi (actually a semi-articulated truck). It is built especially for the containerization market. Containers are typically 40' long but can be 20', 45', 48' and 53'. After the Second World War, increasing international agreement on container sizes allowed the cheaper transfer of containers on ships and by rail. They are 8' wide, but heights have varied: originally they were 8' high, but now 8'6" is more standard, and oversized 9'6''high containers are available. Maximum overall width is 8'6".

An empty 40' container weighs approximately 8,300 lbs. References give different weights of cargo that they can carry, but commonly around 52,000 lbs. The combined weight is around 60,000 lbs.

The tractor is typically another 18,000 lbs. bringing the total laden weight of a tractor-trailer to around 78,000 lbs. The limit is 80,000 lbs. though 90% of tractor-trailers weigh under 73,000 lbs. fully laden. The axle maximum is 20,000 lbs. as long as there is 35' between the trailer's two outer axles. This prevents bridges collapsing.



One 80,000 lbs. truck causes as much road wear as 750 two-ton cars!

In 1979 Renault bought 10% of Mack and three years later 20%. The next year they bought 40% when Mack had an IPO. By 1987 Renault owned the majority of Mack shares. In 2000 Volvo bought out Mack, and six years later they moved all Mack plants to Macungie, PA.

Mack now sells in 45 countries. They also have a plant in Brisbane, Australia. Their current truck models are called Anthem, Pinnacle, Granite, and Smartway. I have never heard of any of them! They are powered by diesels up to 16 cylinders with electronically controlled fuel injection and high horsepower to

weight ratios, aided by fiberglass cabs. Volvo (who bought out Mack) is #5 in US truck sales after Freightliner (40%), Kenworth (14%), Peterbilt (14%), and International (11%).

3.5 million professional truck drivers work in US, and 5.2 million also work in the industry not as drivers. Out of 130 million full-time employees in the US that means 7% of the working population work in the trucking industry. Vehicle registrations in 2015 comprised 141 million trucks (of which 9% were class 3 to 8), 113 million autos, 9 million motorcycles, and 1 million buses.

Trucks are classified in different classes, according to GVWR (Gross Vehicle Weight Rating) i.e. fully laden weight. In the olden days they were classified according to how much cargo (payload) they could carry. Thus cargo (also called payload) plus empty truck (also called tare) equals maximum GVWR. For example, a Ford F 250 weighs around 6,000 lbs. empty and can carry up to 4,000 lbs. of payload (including fuel and people). It can also tow up to 13,000 lbs.

Class 1. Up to 6,000 lbs. GVWR e.g. Toyota Tacoma (~ ½ ton truck) Class 2a. 6,000 - 8,500 lbs. GVWR e.g. Ford F150 truck (~½ ton truck) Class 2b. 8,500 - 10,000 lbs. GVWR e.g. Ford F 250 (~ ¾ ton truck) Class 3. 10,000 - 14,000 lbs. GVWR e.g. Ford F 350 (~1 ton truck) Class 4. 14,000 - 16,000 lbs. GVWR e.g. Ford F 450 (~1½ ton truck) Class 5. 16,000 - 19,500 lbs. GVWR e.g. bucket truck. Class 6. 19,500 - 26,000 lbs. GVWR e.g. beverage truck, school bus. Class 7. 26,000 - 33,000 lbs. GVWR e.g. refuse, furniture truck, city transit bus. Class 8. Over 33,000 lbs. GVWR e.g. cement truck, tractor-trailer, dump truck. Tractor-trailers are mostly up to 80,000 lbs. GVWR (cargo capacity 26 tons). Off highway or mine trucks have a capacity for 15 – 100 tons.

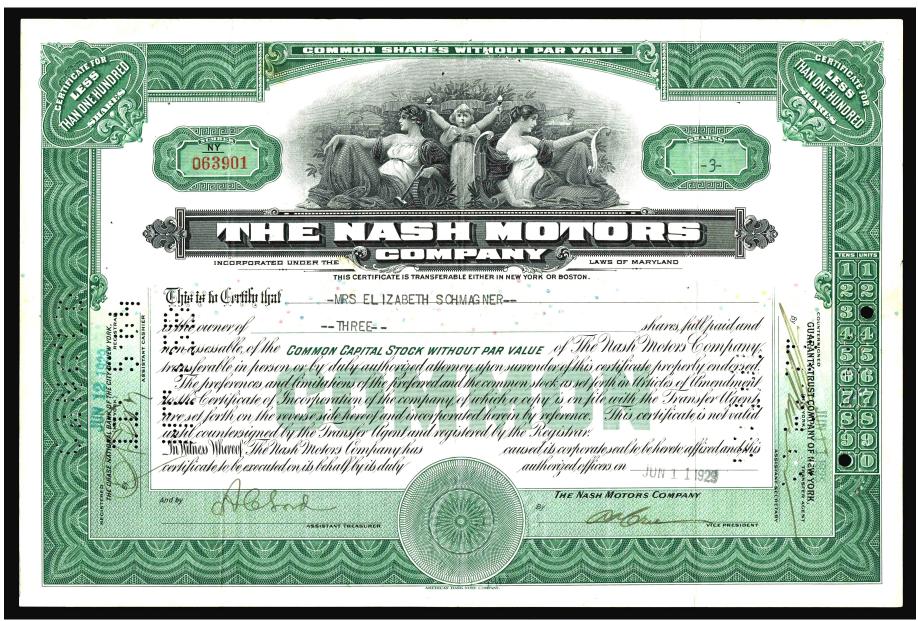
They call Class 1, 2, and 3 light trucks, the sort many normal people drive. They call Class 4,5, and 6 medium trucks. And they call Class 7 and 8 heavy trucks. These require a CDL (commercial driver's license) to operate.

Mack Trucks were in the DJIA 30 1924 to 1931.

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DOT bridge formula from ops.fhwa.dot.gov



16. Nash Motors Company Stock Certificate. Three shares of common stock issued to Elizabeth Schmagner, issued June 1929.

Number matrix to right, punch cancelled on left and right: CANC'L'D | 11.5.64 | HT + SB. Although the Wall Street Crash occurred four months after she bought these, she must have lived through the Great Depression until selling them off 35 years later.

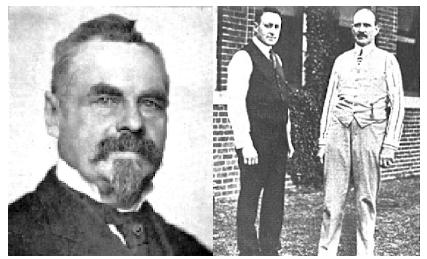
Incorporated in State of Maryland, and printed by ABNCo.

#1972



Vignette of Nash Motors Child holding two torches at center, flanked by allegories of mechanics left, and learning right.

Thomas Jeffery (1845-1910) immigrated to the US from England aged 17. Setting up in Chicago, he built telescopes and models for the patent office. He then manufactured "Rambler" bicycles, which became the number two selling bicycle in the US. He invented the clinched tire/rim to stop tires falling off the rim. He also invented the pneumatic tire, whose rights he sold to Dunlop.



**Thomas Jeffery.** Charles Nash left with Charles Jeffery right.

In 1897 Thomas built his first Rambler auto. He then sold his bicycle plant and built an auto factory in Kenosha, WI. He was the second person to use a production line to make automobiles, after Ransom Olds. Ford was not the first. When in 1902, he started his Rambler production line; he was the second largest US auto manufacturer. He died in 1910 aged 65. His son, Charles, took over and made the Jeffery Quad, a four-wheel chain drive truck which became the workhorse of the Allied Expeditionary Force during the First World War (1914-1918).

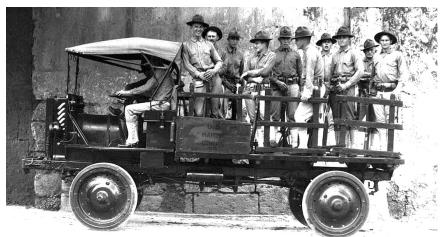
Charles was a passenger on the Lusitania, which was sunk by a German submarine off the Irish coast in 1915. He survived, but his near death experience made him change his priorities. The next year he sold his factory and business for \$10 million to Charles W. Nash, former GM President. The company became Nash Motors.



<u>Drawing of Thomas B. Jeffery Company in 1915, second largest US automaker.</u> By 1916 it covered 20 acres under roof, and an 80 acres test track.

Meanwhile, Charles Jeffery retired to the life of a gentleman. He spent his days collecting books, maps and autographs, till his death in 1935.

Nash focused on "honest worth"; his slogan was "give the customer more than he paid for". The Jeffery Quad became the Nash Quad. They sold 11,500 in seven years – the leading truck during the First World War.



Nash Quad Truck Ca. 1916-1917, carrying US Marines.

Nash persuaded Nils Eric Wahlberg, chief engineer of GM's Oakland Division, to move to Nash Motors. Wahlberg introduced overhead valves and flow-through ventilation, still used in most vehicles today. He also made the front wheel track slightly narrower than the rear wheels, which improved stability and cornering. Wahlberg also advocated wind tunnel testing.

Nash Motors were the first to install seatbelts, and the first to try monocoque (unibody) construction. Nash autos were so popular that most autos sold before they even left the factory.

In 1925 Nash introduced a new marque "Ajax", manufactured in his recently bought Mitchell Motor Car Company plant in Racine, WI. He soon realized it would sell better with the Nash nameplate. So, in 1926 he renamed it the "Nash Light Six". Indeed, it sold much better!



Nash Six Touring Automobile 1927.

Nash gave all Ajax owners free conversion kits with badges, hubcaps etc. to convert their Ajax to a Nash, realizing the Nash name had better resale value. He also started a full size marque called Ambassador. In 1937 he bought out Lafayette Motors in Milwaukee, WI, continuing their marque.



Lafayette Series 3818 4-Door Sedan 1938.

In 1936 Nash offered "Bed-in-a-car". The rear seat back moved in front of the rear seat exposing the trunk, allowing two adults to stretch out with their legs in the trunk. Their movable seats were another first in the industry.

When Nash retired in 1937, he asked George W. Mason of the Kelvinator Corporation to take over operations. Kelvinator made top of the line fridges and kitchen appliances. The new company was called Nash-Kelvinator Corporation. Next year they introduced optional car heating using water heated by the engine, a technique still used today. A year later they introduced a thermostatically controlled heater.

The 1941 Nash made the first mass produced unibody auto in US. In 1949 Nash introduced the Airflyte, born from wind tunnel experiments to reduce drag. It had a one-piece curved safety glass windshield. They sold very well from 1949 to 1951 when Nash was at its pinnacle, outselling the Chrysler Airflow. After many commented that the Airflyte looked like an inverted tub, Pininfarina, the famed Italian designer, redesigned it with a more squared off look.



Nash Statesman 2-door Sedan 1951, an Airflyte.



1959 First generation Rambler American 2-door sedan, 1st US compact car.

In 1954 Nash-Kelvinator bought Hudson Motor Car Company, at the time the largest corporate merger in US history. They renamed themselves AMC. They wanted to focus on the smaller Rambler and have Hudson make full sized autos. The Rambler line overtook Nash and Hudson as AMC's number one car. In 1958 they built their first compact car, the famous Rambler American.

The Rambler came as several versions: the compact Rambler American (1958-1968); the mid-sized Six, V8 Rebel, Ambassador and Classic (1957-1966); and various Australian models. But AMC only had 4% of the American market at the time.

When I traveled to Canada in 1974 to do a pediatric residency, I asked people what would be a good reliable car to buy – several people said "a Rambler".

In 1965 AMC models gradually replaced Ramblers. In 1968 the Ambassador was the first US auto with air conditioning as standard, preceding the Imperial, the Lincoln, and the Cadillac. AMC bought out Jeep in 1970. The Arab Oil Embargo started in 1973. AMC were well positioned to take advantage of this with their compact Gremlin, and later Pacer, but they were still gas-guzzlers.



1972 AMC Gremlin 5-liter V8 1st North American built subcompact.



1975 AMC Pacer, 1st wide subcompact with full size luxury feel.

In 1978, AMC made \$102 million on Jeeps but lost \$65 million on its non-Jeep autos. America was still in love with large cars. But, their aging Kenosha AMC facilities and competition from imports dropped their market share to 1.7%.

AMC had made the Rambler Marlin the first muscle car (which in 1965 had disc brakes as standard - the first US car to do this). In 1980 AMC introduced the first crossover SUV 4WD called the Eagle.

In 1979 AMC partnered with Renault who would later take over AMC in 1983. The new Jeep Cherokee and Wagoner line was popular, but their other autos struggled. In 1986 anarchists assassinated Renault Chairman George Besse for having lain off 60,000 French workers. This prompted Renault to divest itself of AMC. In 1987 Chrysler bought out AMC. AMC continued manufacturing the Dodge Omni and Plymouth Horizon, both with FWD and horizontal engines.

AMC's corporate culture had something to teach Chrysler. They relied on outside vendors to supply components if cheaper. AMC pioneered life-cycle management i.e. managing the product from inception, engineering, manufacturing, and servicing. They used this, rather than expensive R & D, to save money. Nash pioneered aerodynamic design, space efficient interiors, 360° glass visibility, low rate financing, heating and air conditioning.

In conclusion Nash evolved from number two (Jeffery Motors) in 1916, to number four (AMC behind the Big Three) in 1954. They were in the DJIA30 from 1928 to 1930 and from 1932 to 1936. Nash-Kelvinator was also in the DJIA30 from 1937 to 1938.

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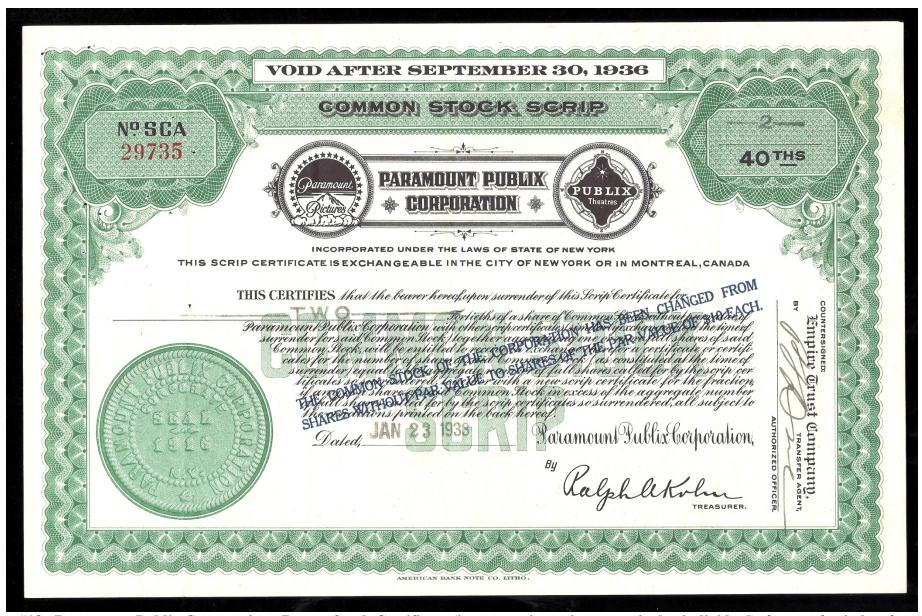
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By Lars-Göran Lindgren Sweden - Own work, CC BY-SA 4.0,

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#18. Paramount Publix Corporation. Bearer Stock Certificate (i.e. not registered to a particular individual), for two fortieths of a share, dated January 1933. Scrip was used if a company was short of cash. Instead of paying cash dividends they could pay scrip like this. An over stamp says the share was \$10, so this was worth 50¢. It was the company's way of giving stockowners an IOU for 50¢. The back of the certificate says the certificate was void on September 30<sup>th</sup> 1936 – i.e. buy more stock with it now! During the Great Depression, it could also have been used in lieu of currency (though people would have discounted it).

#1962.

Paramount Publix was a Los Angeles film studio, the fifth oldest in the world:

- 1895 Gaumont Film Company, France is the oldest
- 1896 Pathé, France
- 1906 Nordisk Film, Denmark
- 1912 Universal Studios, US
- 1916 Paramount Studios US

Today the Big Six film studios are:

- Warner Bros Pictures
- Twentieth Century Fox
- Paramount
- Universal
- Sony (was Columbia-Tristar)
- Walt Disney Studios

The Big Five in the golden age were:

- Warner Bros Pictures
- Twentieth Century Fox
- Paramount
- Metro-Goldwyn-Mayer
- RKO Pictures

Interestingly, the US does not make the most films in the world. That honor goes to India who made 1,986 films in 2017 with \$2.4 billion in box office sales from 2.3 billion tickets. Indian films accounted for 85% of their receipts. By contrast US made 791 films in 2015 with \$10.2 billion in box office revenue from 1.1 billion tickets. US films accounted for 89% of their revenue. World box office revenues from movies were \$41 billion in 2017. Movie companies also make money from branding, video rentals and sales, TV reruns, theme parks, etc.



Adolph Zukor in 1913. He looks a bit like Houdini!

Adolph Zukor (1873-1976) was Jewish from Ricse, Hungary. He immigrated in 1891 aged 18 to New York City where he started an upholstery shop in New York City, then apprenticed as a furrier. Two years later he moved to Chicago where he opened his own furrier business employing 25 men.

After a successful ten years as a furrier, he decided to invest in movie theaters. He would later invest in penny arcades and nickelodeons, which appealed more to the working class. In 1912 he founded the **Famous Players Film Company**, a closely held company, to offer feature length movies, which appealed more to the middle class.

His first movie was *Les amours de la reine Elisabeth*, starring Sarah Bernhardt. This was the first US full-length feature movie running into four reels.



Still from the movie showing the love affair between Elizabeth I, played by Sarah Bernhardt, and the Earl of Sussex, played by Lou Tellegen.

Jesse Lasky in 1912 borrowed from his brother-in-law, Sam Goldwyn, to start a similar Lasky Feature Play Company. This was also closely held like Zukor's. In 1914 a Utah theater owner, W. W. Hodkinson, started Paramount, which distributed Zukor's and Lasky's films nationwide.

In 1916 Zukor and Lasky bought out Hodkinson and merged the three companies into Famous Players-Lasky Corporation (FPL).

Their only competitor was First National, founded in 1917 as a conglomerate of 26 cinema chains producing and distributing movies. Warner Bros later took them over in 1928. It was First National who gave Charlie Chaplin \$1 million for his first movie "A Dog's Life" in 1918.

Zukor invested \$10 million in FPL's own chain of first-run cinemas. By contrast second-run cinemas were less lucrative, showing older films, the equivalent of Netflix today.

Zukor focused on stars and cultivated Mary Pickford, Douglas Fairbanks, Gloria Swanson and Rudolph Valentino. Zukor invented "block booking". This meant that any first—run cinema wanting a specific star's films had to buy a whole year's worth of Paramount movies. Thus, Paramount led the movie industry until around 1940. After successes in the movie business he moved in 1918 to New York City, where he bought an 800-acre estate with its own golf course, swimming pool, Movie Theater and mansion.

Zukor continued investing in 2,000 first-run cinemas called Publix theaters. **Paramount-Lasky** became **Paramount Publix** in 1927. They pioneered:

- Paramount News 1927-1957.
- The first talkies in 1929.
- The first musical, Innocents of Paris, starring Maurice Chevalier.
- Paramount cartoons e.g. Popeye the sailor.

Paramount used its overvalued stock to expand business, ultimately going into receivership in 1933 and bankruptcy in 1935. They then reorganized as **Paramount Pictures Inc.** with Zukor as chairman, making only movies. In Chapter 11 bankruptcy, businesses can reorganize e.g. reducing expenses, renegotiating debts etc.



Mae West publicity photo in 1932 aged 39.

In the 1930s some of the big talkies stars were Mae West, W. C. Fields, Marx Brothers, Carole Lombard and Marlene Dietrich. Paramount turned out 60-70 movies a year. It was Mae West's sex appeal that led to the enforcement of the 1934 Hays Code, i.e. movie censorship. "Pre-code" Hollywood was 1929-1934 (the talkies era without censorship). Once asked about censorship, Mae West cleverly replied: "I believe in censorship. I made a fortune out of it"!

In 1940 the US government enforced a decree to stop block booking. After that Paramount reduced from 71 films to 19 a year. New stars like Bob Hope and Paulette Goddard appeared. Wartime movie attendance exploded, increasing profits.

In 1948 the Federal Trade Commission objected to the same company making movies and owning theaters, what today we would call vertical integration. The Supreme Court ruled that movie studios could not own theater chains. And that was the end of the Hollywood studio system. Paramount spun off **United Paramount Theaters** (UPT), which had 1,500 theaters. UPT could not make movies, but bought ABC TV in 1953, ultimately selling out to Capital Cities, later acquired by Walt Disney in 1996.

Paramount launched the Paramount TV network (PTN) in 1948. But the FCC prevented it from owning more than five stations making it difficult to expand nationally. Paramount declined without the cinema income and sold off its library of films in 1958.

In 1966 Zukor aged 93 was still chairman of Paramount Pictures (who made movies). He sold out to **Gulf and Western Industries Corporation** (GWI). GWI produced The Godfather, Love Story and other movies. They also bought Desilu (Desi Arnaz and Lucille Ball) and used Star Trek and Mission Impossible, to invigorate Paramount TV.



Paramount logo while under Gulf and Western Industries Corporation.

In 1970 Paramount partnered with Universal Studios to form Cinema International Corporation to export movies. Cinema International later enlisted MGM's help. Paramount entered the home video market as Paramount Home Entertainment and CIC Video in the 1970s.

Paramount TV launched United Paramount Network in 1995, which merged with Warner Bros network to become CW Network (i.e. CBS and Warner Media) in 2006.

Paramount Pictures continued with successful movies in the 1980s and the 1990s like Airplane and Indiana Jones. In 1989 GWI dumped its non-Hollywood industries and focused on entertainment including Paramount Parks.

In 1993 Viacom bought Paramount Holdings for \$10 billion. Six years later Viacom bought CBS.

It was Paramount that made Titanic in 1997, their highest grossing movie. The corporate trajectory of Paramount from 1970s is truly dizzying! In 2005 Viacom split into Viacom (with Paramount Pictures) and CBS (with Paramount TV). Viacom sold off Paramount's theme parks and cinemas. DreamWorks SKG was acquired by Paramount in 2005, only to leave again in 2008.

The next owners were the Redstones. Michael Rothstein (1902-1987) formed the Northeast Theater Corporation. His son Sumner (1923-) in 1940 persuaded him to change their family name to Redstone. Sumner grew the business into **National Amusements** (NA), one of the largest media conglomerates in US, which is closely held. Sumner had two children, Shari (1954-) and Brent (ca. 1951-).

Brent, a lawyer, sued his father and sister after they removed him from the board in 2003, ultimately reaching a settlement. Then in 2016 a court-ordered geriatric psychiatric interview found Sumner mentally incompetent. Shari took over the running of NA and owns 20% of it. Sumner owns the remaining 80%, reputedly worth \$5 billion. NA owns Paramount Pictures, CBS Corp, Viacom, MTV Networks, and BET (Black Entertainment TV).

A list of Paramount's divisions, subsidiaries, joint ventures and production deals would fill several pages. But importantly it is still in business. Paramount-Lasky was in the DJIA 24 from 1925 to 1927. Paramount Publix was in the DJIA 30 from 1928 to 1931. Today it is not a publicly traded stock and lives on as Paramount Pictures owned by National Amusements.

Thus, the sequence was: -

Famous Players → Famous Player-Lasky → Paramount-Lasky →

Paramount Publix (Paramount Pictures)

and Paramount Theaters)→Paramount Pictures

Then Paramount Pictures sold in sequence to: Gulf and Western Industries
Viacom
National Amusements



Paramount Pictures Melrose Gate Entrance in Hollywood.

Incidentally - the highest grossing movies of all time adjusted for inflation are:

- 1. Gone with the Wind in 1939 by Selznick-MGM. \$3.6 billion.
- 2. Avatar in 2009 by Lightstorm Entertainment. \$3.2 billion.
- 3. Titanic in 1997 by Paramount. \$3 billion
- 4. Star Wars in 1977 by Lucas Film. \$3 billion
- 5. Sound of Music in 1965 by Twentieth Century Fox. \$2.5 billion.

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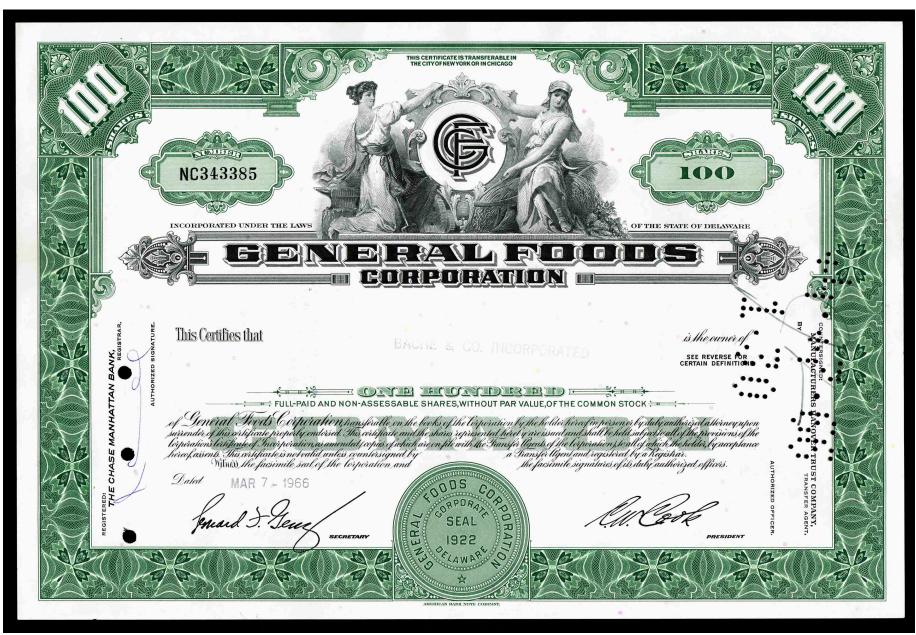
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#19. General Foods Corporation, formerly Postum Inc. 100 shares of common stock to Bache & Co. Inc. in March 1966.

Hole and punch cancelled +4+7+66 | 1.30. Incorporated in Delaware in 1922, printed by ABNCo.

#2059.



General Foods Corp vignette, a rather uninspiring GFC held by two ladies: the left with anvil, hammer & cogwheels; the right with grain & vegetables.

Charles William Post (1854-1914), often called CW, was born like Lincoln in Springfield, IL. For ten years he made and sold agricultural machinery. He invented a plow, a harrow (like a giant rake) and a hay-stacking machine.



Charles William Post in 1914.

Aged 20 he married Ella Merriweather. Eleven years later he had a nervous breakdown and moved to Texas and went into real estate development. Aged 37 he had another nervous breakdown and became a patient in Kellogg's sanatorium. There Kellogg inspired him.

When I was a medical student in the 1970s psychiatry recognized only five diagnoses: schizophrenia, depression, anxiety, sociopathy and retardation. Now they seem to recognize thousands! A nervous breakdown is when mental disorders become so severe that normal activities like work and social and financial functioning become impossible. WC's intermittent breakdowns were likely from depression, today often very treatable.

Ella remained devoted to him, nursing him and supporting him through his mental illnesses. In 1895, aged 41, he founded Postum Cereal Company in Battle Creek, MI, producing Postum Cereal beverage, a substitute for coffee which he hated. Two years later he added Grape Nuts cereal. Aged 50 he divorced Ella and married his 27-year-old secretary. Two years later he bought 225,000 acres of Texas real estate on the southeast edge of the Great Plains, with designs for a new town, Post City. This later became simply Post. He wanted this to be a utopia with a cotton mill as the main industry. He forbade alcohol and brothels. To create rain, Post tried explosives, but met with no success!



Begin Early—
Children "brought up" or

# POSTUM

Postum is made of clean, hard wheat, skillfully roasted, including the bran-coat which contains the Phosphate of Potash (grown in the grain) for building healthy brain and nerve tissue.

Begin early to insure a healthy nervous system for the little ones

"There's a Reason" | | leed Postum—served with sugar and lemon is a delicious, cool-



Held back by Coffee . . this boy never had a fair chance

	•	
A source, "they call him "in degrant." As they are, the street that a size in the street is the same that they are the street in the same that they are the street in the street in the same that they are the street in the s	the fact that on alternote models of these defined on the place of the control of the place of t	bleun her medlime driit, has a nom a demin an year enfolt i ris richt in per in frac, je arabolystaren, in mierzilarte body holding demons that de hold politike gebenne that de holding demons that de sa difference to the shell.  No wender stander fract the through highesthool ages, who Plenton modes with size when things, and bester various.  Bester various.  Bester various.  Bester various.  Bester various de holding wenter that her bester various de holding wenter of holding wenter with the same district with the same district with the same district with the same district various.  Bester various wenter with the same district with th
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teks and sparkling eyes. It lowers their vital- ie, lessons their tenstance to disease, and impers proper development and growth.	"But" many parents say, "my youngeters need a hot drink in the morning." Of course they do, But why one that team down? Why	Name
Read this amazing proof!	not one that builds up? Give them Postum made with hot milk. It contains no drug-no	City State  Fell in complete print was and miles.

### Typical Postum Advertising frightening people away from coffee and tea.

Post marketed Postum by negative false advertising about coffee. A 1933 ad said, "By crowding milk out of the diet of children, coffee is a cause of undernourishment. It robs children of their rosy cheeks and sparkling eyes. It lowers their vitality, lessens their resistance to disease and hampers proper development and growth".

Of course, young children do not drink coffee! Post said caffeine caused heart disease, rheumatism, blindness, cowardliness and poor grades in children. He introduced a comic strip called Mr. Coffee Nerves.

Post claimed in 1907 that Grape Nuts could cure appendicitis. Collier's Weekly magazine questioned this. Post's Trump-like response was to question the mental capacity of the author. Collier's sued and won \$50,000 for libel. Post still claimed Grape Nuts steadied the nerves. Not only that, he proclaimed it prevented malaria and tuberculosis!

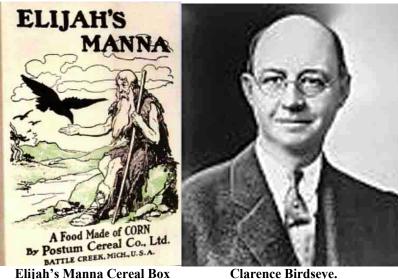
We may laugh now, but at the turn of the century repeated false advertising to a medically uneducated population was persuasive.

Post was vehemently anti-trade union and espoused an open shop system. This is when a union, chosen by a majority of employees represents all employees without union membership being required. Nevertheless, Post paid the highest wages in the industry. He also paid for sick and accident benefits, helped employees buy company made housing, and stressed safe working conditions.

In an ironic twist Post developed appendicitis and asked the famous Mayo brothers to operate. There is debate as to whether they operated. Two months later Post shot himself (likely his depression had returned).

His only child Marjorie, who inherited his fortune, said that her mother died from a broken heart after Post divorced her to marry his secretary. Marjorie herself married four times! She sold her 177-acre estate on Long Island to Long Island University, which founded the CW Post Campus there.

Post used the advertising slogan "There's a Reason" (i.e. to drink Postum not coffee). He made it with wheat, molasses and bran. They initially brewed it like coffee, and then in 1911 started instant Postum.



Clarence Birdseve.

In 1897 Grape Nuts were a blend of wheat and barley. He also made corn flakes in 1904, which he tried to call "Elijah's Manna". But customers resisted the inaccurate biblical reference. A box showed Elijah sitting on a rock with a raven feeding from his hand. Church groups were outraged at using Elijah as a cereal name. Post remained obstinate till sales sputtered. He renamed them Post Toasties in 1908. Mickey Mouse replaced Elijah on the box!

Clarence Birdseye (1886-1956) worked as a fur trader in Labrador from the age of 16 to 20 and experimented with frozen foods. Aged 37 in 1923 he patented a process for quick freezing foods. The next year with three investors he started General Seafoods Company in Gloucester, MA, to freeze haddock filets.

Post's daughter Marjorie happened to be in Gloucester, MA, in her yacht, Sea Cloud in 1926, and dined on frozen haddock. It took her three years to convince Postum management in 1929 to buy a 51% interest in Birdseye's Seafood Company for \$10.75 million. Goldman Sachs owned the other 49% until 1932. A brief diversion about Marjorie:

Marjorie married four times and lived a lavish life style. She owned the world's largest yacht at the time and built Mar-a-Lago (Spanish for "Sea-to-Lake") in Florida. Trump bought Mar-a-Lago in 1985. Marjorie first married Edward Close, an investment banker, for 14 years. Their granddaughter is the famous actress Glenn Close.



Marjorie Merriweather Post Hutton Davies.

She next married E.F. Hutton, a Wall Street broker, for 15 years. Then for 20 years she married Joseph Davies, the ambassador to the Soviet Union. During that marriage she became an avid Russian art collector. Her last marriage was for six years to Herbert May, a businessman, whom she divorced five years before she died in 1976.



Mar-a-Lago, Marjorie's resort in Florida.



Marjorie's yacht Sea Cloud, the largest private yacht in the world at the time.

Postum changed its name to General Foods (GF) in 1929. General Foods engineers designed freezer cabinets to display frozen foods for stores. During the Second World War coffee was rationed and Postum sales rose. It is still popular with Mormons.

In the 1950s GF bought Kool-Aid and Tang, and in the 1960s they bought the Burger Chef fast-food chain and Rax Restaurants. In 1964 they introduced the first US brand of freeze-dried coffee called Maxim. Post would have turned in his grave! During the Second World War they invented the process of freeze-drying. First, they froze the food; next they put it in a vacuum and heated it. The ice crystals evaporated by a process called sublimation. Then the food was put in nitrogen to prevent water or oxygen contamination.

Acquisition fever started in 1981 when GF bought Oscar Mayer. Four years later, Philip Morris bought GF for \$5.6 billion. In 1989 GF merged with Kraft Foods, after Philip Morris bought Kraft Foods the year before. In 2007 Kraft again became independent. Kraft stopped making Postum in 2007. They restarted in 2013.

In 2012 Kraft Foods split into Mondelez, a world confectionary and snack company, and Kraft Foods Group, a North American grocery group. In 2015 Kraft Foods merged with Heinz to become Kraft-Heinz, the fourth largest food and beverage company in the world, employing 39,000 people and with revenues of \$26 billion. In 2017 Kraft-Heinz failed in a bid to buy Unilever for \$143 billion.

The top food and beverage companies in the world are now Nestlé (Swiss), with a market value of \$230 billion; Coca-Cola (US) with a market value of \$183 billion; PepsiCo (US) with a market value of \$160 billion; then Kraft-Heinz with a market value of \$110 billion.

Postum was in the DJIA 30 from 1928 to 1929. They became General Foods, who were in the DJIA 30 from 1930 to 1985.

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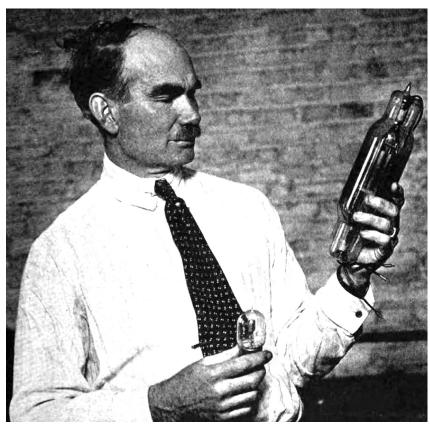


#20. RCA. Stock Certificate. One share of common stock to H.H. Palmer dated January 1920. This was a temporary certificate exchangeable for a permanent engraved certificate and is uncancelled on front or back. Either a permanent certificate was issued, or this was stuck in a pile somewhere that later came to light. Or, the owner could have stuck this somewhere and forgotten about it.

#1878

Radio Corporation of America (RCA) issued five million preferred shares at a par value of \$5, and 5 million shares of common stock were issued. Preferred shares were more popular in those days, as they promised specified dividends, (sometimes not paid, or accumulated as IOUs). Also, if the company went bankrupt preferred stockholders were paid before common stockholders. Preferred shares were half way between bonds and stock, with the added advantage that if the stock got very high, they could be exchangeable for common stock.

Empire of the Air: The Men Who Made Radio is a book by Tom Lewis, published in 1991; it was adapted into a Ken Burns documentary film the same year. It is a history of early of radio mainly focusing on David Sarnoff, Lee de Forest and Edwin Armstrong. The title of the book and documentary is from a quote by Lee de Forest: "I discovered an Invisible Empire of the Air".



Lee de Forest (1873-1961) inventor of the triode.

Lee de Forest (1873-1961) got a doctorate in electronics from Yale and became an electronics inventor. In 1902 he went into business with a dishonest promoter, Abraham White, who was later convicted for stock fraud. Four years later de Forest resigned and set up his own company United Wireless Telegraph.

De Forest made the first ship-to-shore radio telephone transmission in 1907. His most important invention was the triode vacuum tube in 1907, which at the time was called the Audion. In 1913 AT&T bought his Audion and other patents for \$50,000. De Forest then set up De Forest Radio Telephone Company in New York City whose radio rights he later sold to AT&T for \$250,000.

De Forrest battled interminably with Edwin Armstrong about who invented the "regenerative circuit" (what we now call an amplifier). The case ended up twice in the Supreme Court, the last time in 1934, affirming de Forest as its inventor.

De Forest also pioneered <u>Phonofilm</u>, variable shades of grey on a movie film to convert into sound. He partnered with Owens and Case who developed the practical camera using this. The camera made talkies commercially viable in 1929. But then de Forest refused to work with them. RCA had another similar process called <u>Photophone</u>. Fox had another system called <u>Movietone</u>.

He married four times, the first time for less than a year, and the second time for three years, suggesting that he was difficult to get along with. He died alone aged 87 with only \$1,250 in his bank account. What emerges is a picture of an egocentric, difficult personality, who, although his triode revolutionized electronics, had an exaggerated feeling of self-importance.



Edwin Armstrong (1890-1954) inventor of superheterodyne and FM.

At the age of eight, Edwin Armstrong contracted Sydenham's chorea, an involuntary movement disorder, which is a rare complication of rheumatic fever, sometimes resulting in life long tic like movements. His photograph shows him in his major's uniform, with his arms tightly folded, possibly to suppress any sudden jerks that may have embarrassed him in front of the photographer.

Edwin invented the "regenerative circuit", but after his patent was submitted de Forest said he had the idea earlier. Later in 1922 Edwin developed a superregenerative circuit, which he patented and sold to RCA for \$200,000, and 80,000 shares in RCA, making him the largest stockholder in RCA.

Edwin also invented FM, which markedly reduced the static and interference in AM transmissions. He offered the patent to RCA, who refused so he started his own FM station W2XMN in Alpine, NJ. Eventually RCA offered to buy the patent but Edwin spent so much time in litigation with RCA around his brilliant patents that he ultimately committed suicide by jumping out of his 13<sup>th</sup> floor apartment window in 1954.

During the First World War (1914-1918) the US government took over most US radio stations (which simply broadcast Morse code). After the war the US Navy tried to keep control of radio because much of it was English owned. The US Navy installed the GE Alexanderson alternator for British owned Marconi, in New Brunswick, NJ, which surpassed all previous transatlantic transmitters.

The US Navy wanted US control of such sensitive technology and pushed GE to buy English controlled Marconi Wireless Telegraph and Signal Co. Ltd. So in 1919 GE bought it and changed its name to RCA to run radio stations. David Sarnoff (1891-1971), general manager at RCA's founding became its president in 1919.



1922 radio station WDY hexagonal studio (also shown on page 115)

David Sarnoff was born in Russia and immigrated to UK with his parents in 1895, then to New York in 1900. His family were very religious Jews, so David spent his childhood in religious studies. His father died from tuberculosis when David was 15. David then became an office boy in Commercial Cable Company, later joining the Marconi Wireless Telegraph Company of America in 1906. During Titanic's sinking, David was the telegraphy manager. He exaggerated his role, and "misspoke", saying he was the lone telegrapher who stayed by his telegraph key for 72 hours to receive messages.

In 1921 RCA used short waves, with a massive antenna system and powerful Alexanderson alternators to generate power. But by 1924 engineers discovered that harmonics could travel farther and better than the primary signal and long wavelengths were better than short wavelengths. Westinghouse launched the first commercial radio broadcasting station KDKA in 1920. The next year RCA set up their first broadcasting station WDY at Roselle Park, NJ.

Another company, AT&T also in the broadcasting field, owned a patent for commercial radio stations. They would only allow RCA to do commercial free broadcasts. But just when RCA decided it could not continue free radio stations, AT&T stopped broadcasting. RCA breathed a sigh of relief and for \$1 million bought up AT&T's two radio stations, in New York City and in Washington, DC.

This allowed RCA to get commercial sponsors. RCA created the National Broadcasting Corporation (NBC). At this time RCA was still a subsidiary of GE, 50% owned by RCA, 30% by GE, and 20% by Westinghouse. More radio stations meant they could sell more radio sets.



RCA Model RC-350-A Radio (1938)

The anti-monopolistic FCC ordered RCA to sell of one of their two stations. They sold it for \$8 million and it later became ABC. Sarnoff set up Radio City Music Hall in New York City, a performance space to make radio broadcasts. Later Columbia Broadcasting System (CBS), founded in 1927, became RCA's main competitor.

After the Second World War CBS set up corporations for each of their top performers allowing them to be taxed at 25% instead of 77% for income over \$70,000. NBC's Sarnoff felt this was ethically wrong, refusing to match CBS's tax dodge. As a result, NBC lost most of its stars to CBS.

RCA sold radios under its own name but GE and Westinghouse manufactured them. RCA took 60% and the manufacturers took 40% of the profits. In 1924 RCA sold super-heterodynes, a special method of tuning invented by Armstrong. After 1927 they sold plug-in radios rather than battery run radios.

RCA manufactured vacuum tubes branded Radiotron in the US, which were a great profit center, particularly le Forest's Audion triode. Naturally transistors, invented by Bardeen and Brattain of Bell Labs in 1947, gradually took over. By 1975 all RCA sets were solid state.

But 150 years ago, most people communicated in person or by letter. Most entertainment was live. At home there was reading, singing, home pianos, musical instrument playing and dancing. Away from home there were theater performances, which later included the movies.

Two important far-reaching invention streams have spanned the last 150 years. The first was communications e.g. telegraphy, telephony, wireless telephones, texting and computers. The second was entertainment e.g. phonographs, tapes and digital storage media, radio, TV and computers. We have now reached the point where modern computers and smartphones are both communication and entertainment devices.

In 1920s home radio, and phonographs became a source of mass entertainment. In 1929 RCA bought Victor Talking Machine Company, the world's largest producer of records and phonographs, which included JVC (Japanese Victor Company). Victor was made a subsidiary of RCA called RCA Victor. In 1931 they introduced 33 rpm but it failed as it was in the middle of the depression. Also the grooves and pick-ups were still too large, performance was poor, and the equipment expensive.

In 1964 Sarnoff said "the computer will become the hub of a vast network of remote data stations and information banks feeding into the machine at a transmission rate of a billion or more bits of information a second... Eventually, a global communications network handling voice, data and facsimile will instantly link man to machine, by land, air, underwater, and space circuits. The computer will affect man's ways of thinking, his means of education, his relationship to his physical and social environment, and it will alter his ways of living". Talk about prescient!!

RCA, GE and Westinghouse had for years created a monopolistic system. In 1930 the US Department of Justice brought antitrust charges against them. After two years of negotiation, GE and Westinghouse agreed to give up their ownership interests in RCA. RCA became independent.



David Sarnoff (1891-1971) guided RCA for 50 years.



Vladimir Zworvkin 1954 with some of the camera tubes he developed.

Sarnoff, realizing the potential of TV, hired Vladimir Zworykin (see picture previous page) from Westinghouse to research it. RCA had to pay Philo Farnsworth \$1 million (a lot of dough!) for his TV patents to proceed. During the Second World War Sarnoff restored France's destroyed radio station as Radio Free Europe and rose to one-star general. After ten years and millions of dollars RCA, led by Vladimir Zworykin, developed black and white TV, which they introduced at the 1939 New York World's Fair.

RCA then sold TVs in New York City where they had a transmitter on top of the Empire State Building. The FCC then adopted the National TV System Committee's (NTSC) recommendations for technical standards in 1941. During the Second World War RCA opened the RCA Research Labs at Princeton, NJ.

In 1949 RCA Victor released 45-rpm singles records to compete with CBS's successful microgroove 33 rpm LPs. By 1950 RCA were also successfully producing 33 rpm LPs.

In 1950 the FCC promulgated color TV standards. By 1953 RCA produced the first commercial color TV sets. But the sets were expensive and programming in color was initially sparse. Color TV sales finally overtook black and white TV sales in 1968. Additionally, RCA produced most professional video cameras.

In 1955 RCA sold their air conditioner and cooking rage lines to Whirlpool Corporation. David Sarnoff led RCA into computers in the 1960s to compete with IBM, but exited the market when they found it too competitive.

In 1965 David Sarnoff's son, Robert, took over as president, though David stayed on as chairman till 1969, two years before he died. David had led RCA for 50 years!

In the late 1960s and 1970s acquisition fever hit RCA started because electronic products from Japan were cheaper. They acquired Hertz rental cars, Banquet frozen food and TV dinners, Coronet carpeting, Random House publishing and Gibson greeting cards! It looked more like compulsive buying disorder!

As RCA's core expertise was in broadcast engineering and satellite engineering, they predictably slid downhill. In 1980s they bought Columbia's home video division, and Arista Records. In 1985 GE reacquired RCA for \$6 billion (the largest non-oil merger in history at the time), which it sliced and diced, selling off most of RCA's assets, including TV sets, consumer electronics, records, semiconductors, the Sarnoff labs (i.e. RCA Research Labs) and NBC.

RCA had been instrumental in developing:

- The electron microscope
- Simultaneous broadcast of color and black and white TV signals
- Video recorders and VCRs
- Liquid crystal displays (LCDs)
- Direct broadcast TV and satellite systems
- HDTV
- CMOS (complementary metal-oxide-semiconductor) technology

- Radar application during the Second World War
- Optoelectronic emitting devices (basis for fiber optic technology today)
- Integrated circuits
- Laser technology
- 45 rpm singles
- RCA connector jack

RCA was in the DJIA 30 1928-1931.



RCA TV set 1939.

Gen. Sarnoff showing vido tape in 1956.

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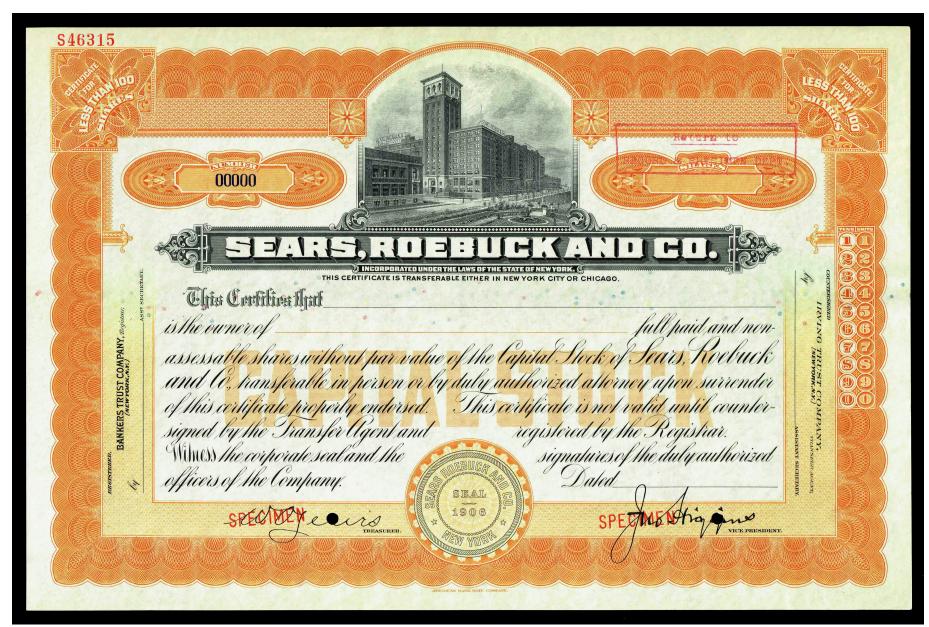
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https://en.wikipedia.org/wiki/Vladimir K. Zworykin#/media/File:Vladimir Zworykin and historic TV tubes.jpg



**#21.** Sears Roebuck Specimen Stock Certificate. Note SPECIMEN stamps, hole punches over signatures, 00000 serial numbers. Note also planchette paper inclusions, an anti-counterfeiting device. Company was incorporated in New York in 1906.

Benjamin Franklin was the first American to produce a sale catalog in1744. His catalog was of scientific and academic books. There were three big US mailorder houses. First came Aaron Montgomery Ward, who started a mail order business in 1872. Then Sears imitated Montgomery Ward in 1886. Third came JC Penney, who started a retail store company in 1906. In 1962 JC Penny bought the General Merchandise Company and entered the mail order business. Sears was the biggest of the three American mail-order houses.



Richard Sears at his desk in 1900.

Richard Warren Sears' (1863-1914) father lost the family fortune in stock speculation. So Richard worked as a railway station agent. While working for the railroad, a local jeweler received an unwanted shipment of watches. This was a well-known scam at the time. The jeweler would say he did not want them. So the supplier would then say that to save on shipping costs, he could have them for a discounted price! Of course, the discounted price was the intended price all the way along! But this jeweler knew the scam and refused the shipment.

Sears stepped in and agreed to take the watches, which he then sold to station agents for a good profit. Watches were the latest "thing". The railroads had just started time zones and coordinated all times within specific time zones so that train schedules would work. Watches were the trappings of sophisticated city folks, the contemporary equivalent of an iPhone. So in 1886 Richard started a mail order watch company with Alvah Roebuck, a watch repairman. Three years later Sears sold his business for \$100,000, a huge sum at the time, and moved from Minneapolis to Chicago.

In 1892 he started another watch and jewelry mail order business with Roebuck, and printed catalogues. The next year was the panic of 1893, caused by railroad overbuilding and shaky railroad financing. By 1894 the Sears catalogue grew to 322 pages and the next year to 532 pages, by now selling everything in sight!

In 1895 Sears offered Roebuck's stake to Aaron Nusbaum, an investor, but he brought in his brother-in-law Julius Rosenwald (1862-1932) a local businessman. Julius paid \$75,000 for Roebucks share. Sears re-incorporated in Illinois with capital stock of \$150,000. However, both Sears and Rosenwald disliked Nusbaum, whom they later had to buy out for \$1 million in 1903.



Julius Rosenwald, Sears' partner, became President after Sears.

In the 1890 census 65% of US population was still rural as opposed to urban. Town dwellers would only surpass country dwellers in 1920. Railroads could ship items almost anywhere, but the US Postal Service still did not visit all rural areas until 1896 when they introduced free rural delivery. Before then you had to go to the local Post Office if you lived on a farm out of town.

Parcel post started in 1913. Before then I assume you had to pick up your item at the local Western Union Office or railway station. Mail order appealed to rural farmers and to Sears, who had grown up on a farm and knew what sorts of things farm families wanted.

In 1906 Sears (the President) and Rosenbaum (the Vice President and Treasurer) incorporated the company in New York with the first major public IPO in US history. The IPO was for \$40 million. By 1908 Sears was even selling mail order homes through its catalog! That year Sears resigned and Rosenbaum took over as President. Sears had developed Bright's disease (progressive kidney failure brought on by an auto-immune reaction to Streptococcal infection). He died in 1914 leaving \$25 million to his wife Anna, who lived on till 1946.

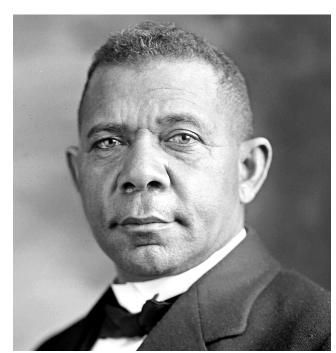
During the First World War (1914-1918) Sears did well as most sales were to rural farmers, who previously had poor access to goods. But after the war, demand for produce fell and farmers suffered badly. Sears also suffered badly, but by 1922 Sears was back in the black.

African Americans were another interesting customer base. No one at Sears knew the skin color of a mail order customer, so they treated them all well. African Americans could buy without being told to go to the back of the line, or to wait until white folks had left, and other such indignities.

From 1890 to 1920 the US urban population grew from 35% to 51%, from 22 million to 54 million people - a huge increase. Rural farmers wanted mail order. City dwellers wanted stores. Rosenwald's brilliance was that he realized this and acted on it. He planned Sears' first store in Chicago, which opened in 1925 a year after he retired. In the 1930s Sears opened one new store every few days all over America! Interestingly, we have now come full circle. Many Americans prefer to shop at home again, using on line websites rather than catalogs. Amazon.com is the modern reincarnation of Sears.

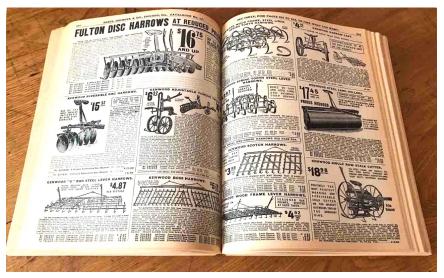
But Sears stores were different. Unlike department stores, they were situated in poorer neighborhoods with easy parking. They directed marketing to men as well as women. They also let customers examine goods without clerks having to serve them. By contrast, department stores were located in upscale neighborhoods, designed to appeal only to women. And they insisted that clerks handle items.

By the time Julius Rosenwald died in 1932 he had given over \$70 million to charities. His favorite was African American education, a fitting bounty for his customer base. Another was the Chicago Museum of Science and Industry. He had an interesting partnership with Booker T. Washington, the famous African American educator. He donated money to build over 5,000 rural schools often called Rosenwald Schools. Rosenwald wrote in 1911 "The horrors that are due to race prejudice come home to the Jew more forcefully than to others of the white race, on account of the centuries of persecution which they have suffered and still suffer."

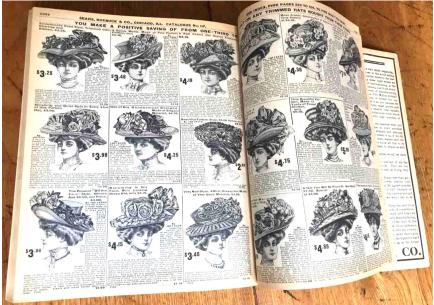


Booker T. Washington, the famous African American Educator.

Sears catalogs were distributed annually at the obvious time of year – before Christmas! The commonest book in rural America was still the Bible, but the second commonest was the Sears Catalog. Farmers could see the latest farm equipment. And farmer's wives could see all the latest hat fashions in town! Old catalogs were often used for pictures for children to play with, to light fires and for the smallest room of the house! In 1933 Sears added another annual wish book of toys and gifts.

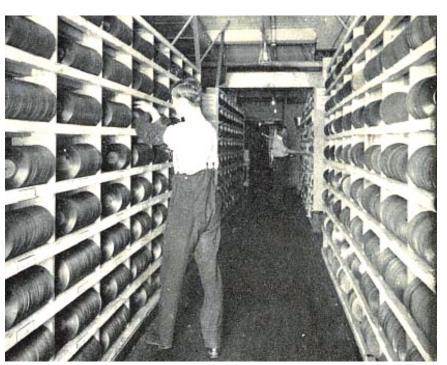






Pages from the 1908 1,184 page Sears Catalogue.

In 1930 Sears added Allstate Insurance. Within a year they had an Allstate Insurance representative in virtually every store. They added financial services, real estate, the Discover credit card, and with the Internet, Prodigy. Sears was an institution. They introduced their own branding like Kenmore appliances and Craftsman tools, which led people to want the Sears brand,



Inside the Sears Warehouse in 1900 showing 78 rpm record storage.



Vignette of Sears Roebuck Mail Order Plant in Chicago, built 1906.

Sears had started with the building depicted on the vignette on the stock certificate on a 40-acre site in Chicago's West side in 1906, shown on the previous page. In 1974 Sears built the world's tallest building, Sears Tower in Chicago, where they moved operations until 1993. Sears, like so many businesses would not last forever. In 1989 Wal-Mart overtook them as the largest US retailer.



Sears Tower the tallest building in the World at the time.

In 1986 "The Sears Case" came to a head. The Equal Employment Opportunity Commission brought a sex discrimination suit against Sears in 1979. For years they had been passing over women for lucrative commission based sales jobs and given them to men. But sadly, the case was only statistically based. After a ten-month trial, the Federal Judge ruled in favor of Sears.

In 1993 Sears stopped producing its annual catalog because of declining profitability of their mail order business. Then the fall started in earnest. It was acquisition fever in reverse. They sold off their businesses one by one to keep going. In 2003 they sold their credit card and financial businesses to Citigroup for \$32 billion.

From 2004 to 2008 Sears stock stood at over \$100. Eddie Lampert, a Wall Street hedge fund guru who had amassed a fortune of \$3 billion, bought out the bankrupt Kmart, then bought a controlling interest in Sears. Lampert merged the bankrupt Kmart with Sears in 2005 to form Sears Holdings. From the stock's peak in 2007, Sears's stockholders lost \$30 billion. Meanwhile the incompetent Lampert burned through four CEOs in eight years then took over as CEO himself, running it by teleconferences from his home in Florida.

Mark Cohen, who used to be CEO of Sears Canada, now teaches business at Columbia. He talks about the five P's of mass retailing: product, price presentation, productivity and people. He pointed to Costco as a retailer that gets everything right. And for years he pointed to Sears as a retailer that gets everything wrong. He predicted their demise.

When Sears Holdings filed for Title XI bankruptcy in October 2018, Lampert, according to the New York Times, blamed the economy, the weather, Wal-Mart, Amazon and everything else. Although he did well as a hedge fund manager, he had no clue how to run a large retail organization.

Sears remained in the DJIA from 1924 to 1999.

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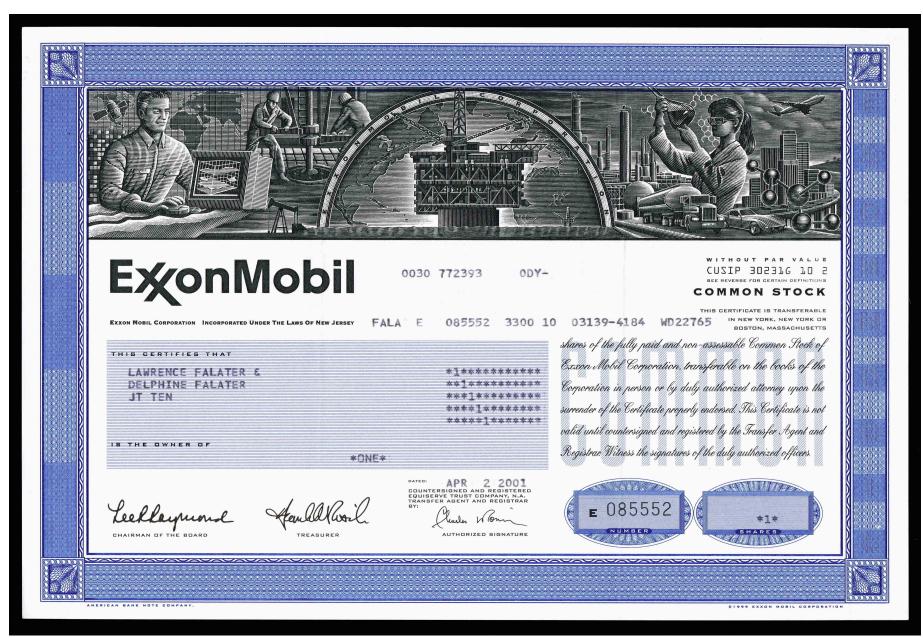
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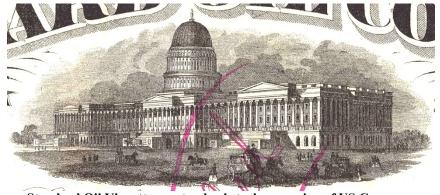


#22. Standard Oil Stock Certificate for 100 shares of \$100, i.e. \$10,000. Did they really know before printing the certificates that the stock was fully subscribed with a capitalization of \$3.5 million? It is dated April 1875. Incorporated in Ohio, and hand signed by Rockefeller as President and Flagler as Secretary. The certificate is pen cancelled. This is the most valuable Stock Certificate I own.



#22. Exxon Mobil Stock Certificate, one of the heirs of Standard Oil. One share issued in April 2001 to Larry Falater, a stock certificate dealer. The certificate is uncancelled. The left vignette depicts oil drilling and a computer technician. In the center is an oil drilling sea platform. On the right is oil chemistry, and its uses depicted with a refinery, transport and city.

#2006



Standard Oil Vignette – a standard stock engraving of US Congress.

John D. Rockefeller (1839-1937) was a ruthless and brilliant businessman who became America's first billionaire. His father, Bill, was a philandering con man, his mother a devout Baptist. Bill left her and bigamously married another woman, leaving John without a father. Aged 14 John's family moved to Cleveland, Ohio. After leaving school he took a six-month business course as a bookkeeper that he completed in ten weeks.

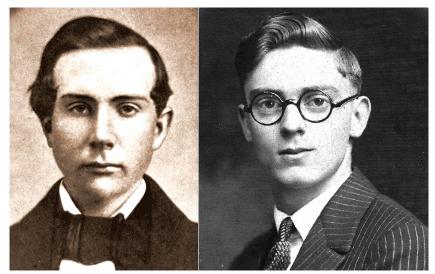
As a boy, John said he wanted to make \$100,000, and to live to be 100. He succeeded in one wish and almost succeeded in the other. After business school he methodically looked for a job for six weeks. He found a bookkeeping job with a Cleveland food wholesaler. He left shortly when they would not pay him what he asked, and started another produce business with a partner, Maurice Clark.

The Federal government in the 1860s subsidized oil, motivating many to drill for oil. The kerosene lamp had been invented in 1853 by the Pole, Igncy Lukasiewicz, replacing candles. So, Rockefeller and Clark got out of the produce business and switched to oil refining in 1863. Whale oil was getting too expensive and America needed kerosene for light. Rockefeller, unlike his competitors, did not dump 40% of non-kerosene oil products. Instead he refined them into heating oil to run his refinery, naphtha, tarmac, lubricating oil, paraffin wax, etc.

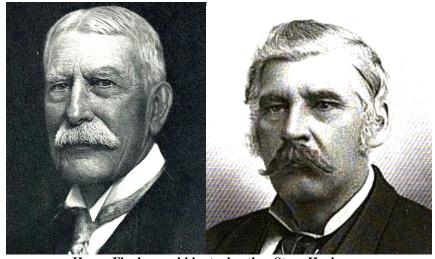
During the Civil War (1861-1865) wealthy people like Rockefeller who, if drafted could pay \$300 to a substitute to enlist in their place. Unskilled wages were then around 10 cents an hour, so \$300 represented more than a year's wages for most (who incidentally worked ten hours a day and six days a week).

In 1865 Rockefeller bought out the Clark Brothers for \$72,500 and established a company with his brilliant chemist, Samuel Andrews. Andrews, who invented fractional distillation, owned 16.7% of the company and refinery. He sold his stock in 1874 long before the excesses of the gilded age. But he was no pauper!

John Rockefeller's brother William built a second refinery in Cleveland and joined the business. Soon they owned the largest refinery business in the world. In 1867 Henry Flagler joined the business. Steve Harkness, Flagler's younger stepbrother, also joined as a silent investor.



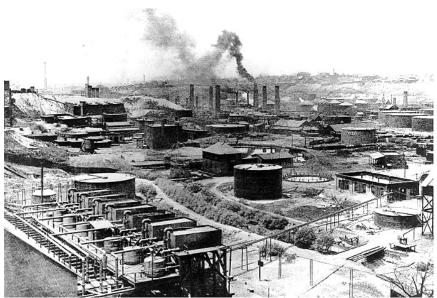
John D. Rockefeller aged 18. Samuel Andrews, early petroleum chemist.



Henry Flagler, and his stepbrother Steve Harkness.

At that time Cleveland had triple the refining capacity for the quantity of oil being produced, which then came from northwest Pennsylvania. In 1870 Rockefeller changed the partnership into Standard Oil Co. of Ohio. The major investors were Rockefeller, Andrews, Flagler, and Harkness.

Rockefeller hired his own barrel makers, bought his own wood, and hired his own plumbers. Cost was the lowest common denominator for everything, including transport. He bought his own rail cars, oil pipelines, and home distribution networks. He also bought out all his competitors, converting each to his own efficient system. His chemists developed 300 non-kerosene products and he kept prices low. He first integrated horizontally (creating a monopoly), and later integrated vertically buying oilfields, railroads, pipelines, etc.



Standard Oil's first Oil Refinery in Cleveland in 1897.

At that time businesses could not operate in multiple states, they had to have one license in each state. In 1879 the State of Pennsylvania indicted Rockefeller for monopoly. Consequently, in 1882 his lawyers came up with the innovative idea of a unifying trust to control all those businesses in different states. A trust is a corporation of corporations. So Rockefeller transferred all Standard Oil assets into the Standard Oil Trust in 1882.

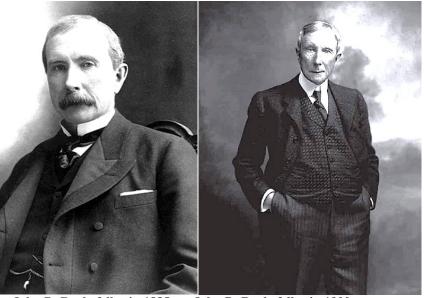


Standard Oil Trust Stock Certificate to Charles Pratt 1883 for \$300,000.

The trust had nine trustees who controlled other companies in different states. They controlled 20,000 wells, 4,000 miles of pipeline and 5,000 tank cars – all vertical integration. They employed 100,000 people. Standard Oil then refined 80-90% of the world's oil. But this was before the automobile.

When electric lights displaced kerosene, Standard Oil expanded to Europe. They also expanded into gas for lights, heating and cooking in the US. Their big boon of course became the auto industry especially after the First World War (1914-1918). In the 1890s Standard Oil even expanded into iron ore and iron ore transportation.

After the Sherman Antitrust Act of 1890, the State of Ohio forced Rockefeller's Standard Oil Trust to break up in 1892. Rockefeller just transferred assets out of state and reincorporated the trust in the State of New Jersey, who allowed trusts.



John D. Rockefeller in 1885 John D. Rockefeller in 1900, note toupee.

In the 1890s Rockefeller developed depression and lost all his hair. Ever after that he wore toupees. Somewhere around 1895 to 1897 (accounts vary) he retired from day-to-day management of Standard Oil and devoted his time to philanthropy. Carnegie would do the same when he sold Carnegie Steel to J.P. Morgan in 1901 for \$303,450,000.

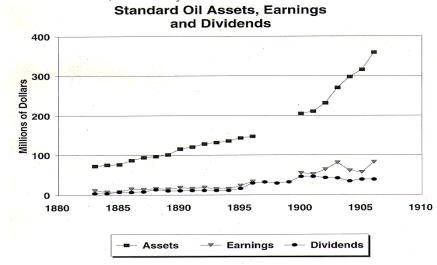
"The History of Standard Oil", by journalist Ida Tarbell, first came out as a serial from 1902 to 1904 in McClure's magazine, then as a book. Ida documented that Rockefeller did not play fair. He used spies, secret deals with railroads, courtroom evasions, price wars, bribes to lawmakers and was generally ruthless. The public couldn't get enough. They lapped it up and reacted against Rockefeller. Ida was a pioneering investigative journalist. Mark Twain (who coined the phrase "gilded age" to describe the excesses of the new wealthy industrialists) also helped her.

In 1871 Rockefeller made a secret alliance with three major railroads, which ran through Cleveland: the Pennsylvania, the Erie and the New York Central. These

three railroads agreed to raise their rates to all oil shippers but to give Rockefeller "rebates" and "drawbacks". They called this secret deal the "South Improvement Company". Within months the Pennsylvania legislature withdrew their charter. But it was too late. Within six weeks Rockefeller had bought up 22 of his 26 competitors. One of these competitors was Ida Tarbell's father, who held out. He was ruined and committed suicide. This "commercial Machiavellianism" as Tarbell called it, inflamed public opinion against Rockefeller.

Rockefeller had previously kept quiet about such matters when complaints arose, but this time he wrote his memoirs. The date was 1908. He said he just "followed the laws of high-class dealing". The public saw straight through his lies. Paradoxically, Ida Tarbell's exposé would later make Rockefeller even wealthier. But the public hate that poured on him stung him. He called her "that poisonous woman".

The public was incensed that Rockefeller had kept his trust for 20 years after the Sherman Anti-Trust Act of 1890. In 1910 the US Supreme Court found Standard Oil in violation of the Sherman Anti-Trust Act and forced it to break up into 34 separate companies. Tarbell's book influenced legislators and led to the Hepburn Act of 1906, the Mann-Elkins Act, the creation of the Federal Trade Commission, and the Clayton Anti-Trust Act.

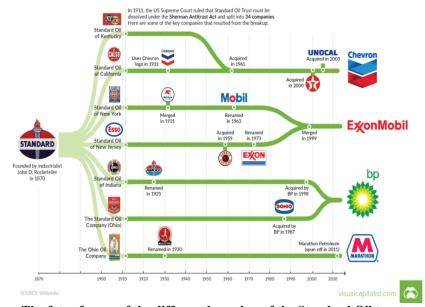


Rockefeller owned 25% of the stock of Standard Oil Trust and after the break-up received an equivalent share of stock in each of the 34 companies. Paradoxically, the break –up made him even richer. The value of these companies over the next decade doubled, making Rockefeller the first billionaire with an estimated net worth of around \$1.5 billion. His 1918 tax return showed his fortune was \$800 million and he had already given away over \$500 million.

Many of the successor companies to Standard Oil became huge themselves. It was Standard Oil of New Jersey that joined the new DJIA 30 in 1928, which became Exxon and later ExxonMobil.



Ida Tarbell in 1904, the same year her book was published.



The fate of some of the different branches of the Standard Oil trust.

In 1902 Rockefeller bought the Colorado Fuel and Iron Company. In 1913 their miners went on strike. The next year, in Ludlow, Colorado, a firefight broke out between strikers and National Guard troops who had been brought in. The striking miners lived in a tent city. Troops set the city on fire, burning fifteen women and children to death. The press excoriated Rockefeller and his local operative, Lamont Bowers. The US Commission on Industrial Relations held hearings that also excoriated the two. Rockefeller's attitude was as usual dismissive. Curiously, his biographer, Allan Nevins, opined that his wealth was "the least tainted of all the great fortunes of his day".



Ruins of Ludlow tent colony after the fire in 1914.

Rockefeller was devoutly religious and read the bible daily – a strange antithesis to his ruthlessness, dishonesty, and behavior. Throughout his life he donated to churches. Later in life his philanthropy became conditional upon the efficient use of funds and matching contributions from others. His funds were a major contribution for the Spelman College (named after his wife) for African American female Baptist Seminarians; the University of Chicago; the Central Philippine Baptist University; and Ivy league universities. He also helped fund Colonial Williamsburg and founded the Rockefeller Institute for Medical Research, which became Rockefeller University that now claims 23 Nobel laureates.

Importantly, Rockefeller also paid to implement the Flexner report, which Carnegie funded. This elevated and made uniform standards of medical education in the US. Many "medical colleges" closed, and many practitioners (particularly electrotherapists, naturopaths and homeopaths) were derided and went out of business.

Earlier in life Rockefeller was unapproachable and unsocial, but later in life he became more social and developed the strange practice of handing out shiny new dimes to people he met. What was a billionaire doing handing out dimes to people! Carnegie's career and retirement would later mirror Rockefeller's ruthless career followed by philanthropy.

Rockefeller's only son was John Jr. He had several sons, David who became CEO of Chase Manhattan Bank; another Nelson who became Governor of New York and Vice President of the US; and another Winthrop who became Governor of Arkansas.

John D. Rockefeller had lived life without smoking or drinking, and in retirement he played golf almost daily. He died in 1937 at the age of 98.

Apart from his ruthlessness bordering on criminality, Rockefeller's business success was based on relentless analysis of economies to be made: hiring good people and delegating to them; horizontal and later vertical integration; plowing back all profits into the business; becoming a monopoly; and developing the concept of a trust to defeat the Anti-Trust Act.

Standard Oil of New Jersey Joined the DJIA 30 in 1928, becoming Exxon in 1973, and ExxonMobil in 2003. Chevron joined the DJIA in 2008 and ExxonMobil is still in the DJIA.

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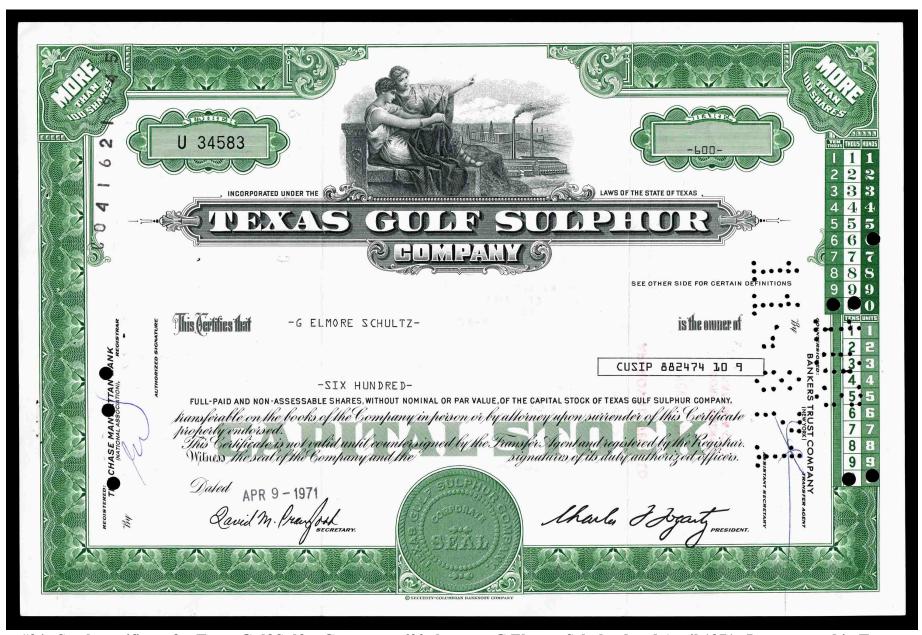
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#24. Stock certificate for Texas Gulf Sulfur Company. 600 shares to G Elmore Schultz dated April 1971. Incorporated in Texas, hole and punch cancelled 103 | 11 8 71. Printed by Security-Columbian Banknote Company. Note number matrix on right, which goes as far as tens of thousands.

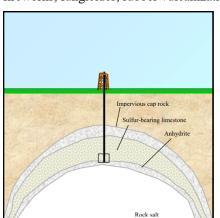
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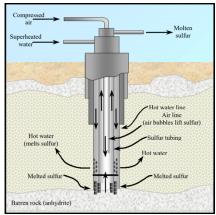
Texas Gulf Sulfur Company started as the Gulf Sulfur Company in 1909 to mine sulfur found in the Big Hill Salt Dome in Texas just south of Houston. The sulfur was extracted using the Frasch Process, which uses three concentric tubes. One tube sends down super-heated water to melt the sulfur (melting point 115° C.). A second tube aerates the molten sulfur with heated air to make it rise. A third tube extracts the molten sulfur froth.

Herman Frasch (1852-1914), a German born American chemist, invented and patented this method of extracting sulfur in 1891. It was the commonest method of extraction until the 1970s. Then ASARCO (American Smelting and Refining Company) recovered sulfur from sulfur dioxide emissions from copper, lead and zinc refining in El Paso, Texas. Standard Oil of Indiana then extracted sulfur from petrol and gas sources using another process, the Claus process.

Sulfur occurs in Texas in the calcite cap rock of some salt domes. Sulfur deposits were first discovered in Calcasieu Parish, Louisiana, in 1865 but the domes were covered with quicksand so could not be approached. Frasch's invention needed a lot of fuel to heat the water, unavailable until the 1903 Spindletop Oil Gusher. Frasch's patents expired in 1912, further reducing costs.

The production of sulfuric acid consumes 90% of elemental sulfur. They use sulfuric acid for making fertilizers, treating copper ores, producing paper, producing plastics, and for car batteries. They use elemental sulfur for matches, fireworks, fungicides, rubber vulcanization and insecticides.





Frasch Process used on a salt dome, showing three concentric tubes.

In 1916 J.P. Morgan and financier Bernard Baruch took over control of Gulf Sulfur Company. In 1918 they renamed it Texas Gulf Sulfur Company (TGS). They constructed a new plant producing 500,000 tons of sulfur the next year. The State of Texas has produced 80-90% of US sulfur for many years.

In 1927 the company bought the Boling Dome, also in Texas. They entered the Mexican market in 1949 starting production from their Nopalapa plant in 1957.

In 1959 TGS surveyed the Kidd Mine in Timmins, Ontario. This became one of the world's deepest metal mines, producing copper, zinc and silver. Initially it was a surface mine, then later subterranean going down 10,000 feet.\*



Kidd open pit mine in Ontario, Canada. World's deepest metal mine.

The 1959 Kidd Mine survey by TGS geologists suggested ore deposits valued at \$2 billion. They told company officials to keep the find secret until TGS could gain rights to the land. Meanwhile TGS issued press releases denying the discovery. It was 1964 before TGS announced the find publicly. But for months before the press conference TGS employees bought up stock at around \$20 per share. Some employees tipped off outsiders too. A month after the press conference the stock shot up to \$58 per share.

The Securities and Exchange Commission (SEC) charged TGS with insider trading. After a seventeen-day trial, Federal District Judge, Dudley Bonsal, cleared the company and all but two of the charged insiders, saying the SEC had failed to show that TGS's press releases were false and misleading!

This was a great setback to the SEC's ability to prosecute insider trading. The case later went to the Court of Appeals, who sided with SEC's "disclose or abstain rule" i.e. TGS should either have disclosed the find, or made no comment. They could not publicly deny known facts.

TGS produced 54% of the world's total Frasch sulfur through 1957. In 1972 TGS became Texas Gulf. Elf Aquitaine bought it in 1981. TGS was in the DJIA 30 from 1928 to1931.

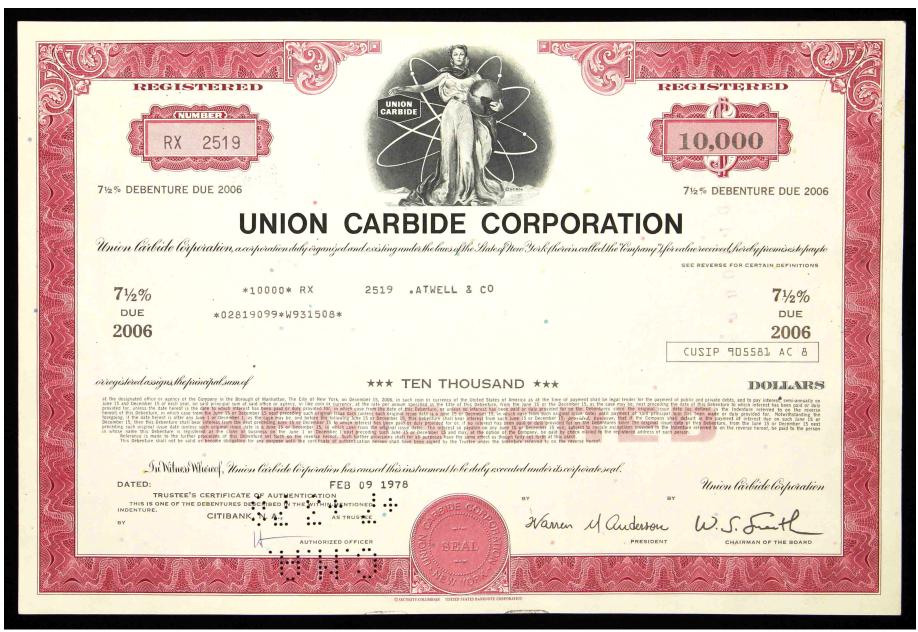
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<sup>\*</sup> The deepest mine is the world is the Mponeng gold mine in South Africa over 12,800 feet deep. Bingham Canyon (Kennecott Copper Mine) is the deepest open pit mine in the world over 3,900 feet deep.



#25. Union Carbide corporation \$10,000 7½ % debenture issued February 1978 to Atwell & Co. A debenture is not backed by specific assets, just a promise to pay. By contrast a bond is backed by specific assets. The debenture is punch cancelled O.N.A. | +7 +3 78. The vignette shows a lady holding a globe with an atom diagram behind her with four electron shells. It was printed by the Security Columbian United States Bank Note Corporation. The company was incorporated in New York State. #1952

Union Carbide is inextricably linked with the Bhopal disaster – once the world's worst industrial accident. Union Carbide started in 1898, to make Calcium Carbide to produce acetylene gas for lighting. Friedrich Wöhler, a German chemist, discovered the chemical reaction in 1862 by, according to the formula:

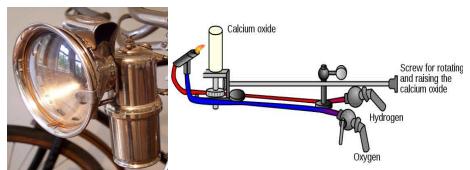
$$CaC_2 + 2 H_2O \rightarrow C_2H_2$$
 (Acetylene) +  $Ca(OH)_2$ 

The acetylene gas burns with oxygen to form water and carbon dioxide:

$$C_2H_2 + 5 O_2 -> 4CO_2 + 2H_2O$$

The light is dazzling. They used it for miner's and caver's lamps, auto and bicycle lamps, lighthouse lamps and to illuminate buildings where electricity did not exist. The first bicycle lamp was invented in 1900. Miners used them widely in the early 1900s. An upper reservoir contained water. From this reservoir, a threaded valve controlled the water drip rate into the lower chamber of calcium carbide. Acetylene gas flowed into the center of a reflector creating a bright unfocused light when lit with a flint.

Limelight is different. This was invented in the 1820s, using a flame from a hydrogen/oxygen mixture blowing onto calcium oxide (lime), which glowed brightly.



Carbide bicycle lamp.

Limelight used in theaters

In 1900 Union Carbide capitalized at \$6 million. In 1917 they merged with National Carbon Company, Linda Air Products Company (who made liquid oxygen) and Prest-O-Lite (who made Calcium Carbide), to form Union Carbide and Carbon Corporation.

Heating lime and coal together in a furnace created calcium carbide. A Union Carbide and Carbon (UCC) employee, George Curme, got the first patent for commercial ethylene production in 1919. A year later UCC produced ethylene glycol or antifreeze, building the first commercial ethylene plant at Clenden, West Virginia.

In 1929 UCC started making a tunnel at Hawk's Nest, West Virginia, to transport hydro-electric power to the UCC plant. However, it took over five years of tunneling and miners were exposed to silica. Many got silicosis. Four hundred and seventy-six died from it, the first of many industrial deaths attributable to UCC.



## UNION CARBIDE GAS

1922 advertisement for Union Carbide gas lighting. Electric lighting was not yet common in many rural areas of the United States

In 1939 UCC acquired the Bakelite Corporation, founded by Dr. Leo Baekeland. Baekeland was a plastics pioneer who invented the second plastic in 1907. The first plastic invention was celluloid in 1869 though it was not called a plastic at the time. UCC had made ethylene since 1919 and would later use it to produce polyvinyl chloride. Waldo Semon at B.F. Goodrich Company discovered the manufacturing process for this in 1926.

During the Second World War (1939-1945) UCC made styrene for plastics and butadiene for artificial rubber. They also refined uranium and contributed to atomic weapons research. After the war, UCC bought the plant the government had set up for these chemicals, in a town named Institute, West Virginia.

From 1947 to 1970 UCC operated Oak Ridge National Laboratories in Oak Ridge, Tennessee. There they used mercury to separate Lithium, later used for batteries. They made Eveready batteries. 2,400,000 pounds of mercury went unaccounted for, probably under the buildings. This was part of a pattern of accidents, explosions, leaks, fines, employee illnesses especially cancer, and hazardous waste violations that would characterize UCC's existence.

UCC created the UC Nuclear Company, and in 1957 changed their name to Union Carbide Corporation (UC). In the 1960s near New Idria, California, they mined chrysotile asbestos and sold it as Calidria (named from <u>Cal</u>ifornia and <u>Idria</u>). UC later sold the mine to their employees. Also in the 1960s, they established divisions of electronics, hydrocarbon, ferro-alloys and mining, and metals.

In 1977 UC acquired the UNIPOL technology for making polyethylene, yet another useful plastic. Four years later, according to Newsweek Magazine, one of UC's Indonesian plants was causing mercury poisoning. Over half the employees had chronic kidney disease from mercury.

And now, the story of the Bhopal disaster: In 1969 UC set up Union Carbide India Limited (UCIL). UC owned 51% and India owned 49%. The UCIL plant in Bhopal, India, started operations in 1979. They made the pesticide Sevin from a gas methyl isocyanate (MIC) as an intermediary. They made MIC by combining the gases methylamine and phosgene. Phosgene (COCl<sub>2</sub>) was the chemical gas in the First World War that killed 85,000 people. Today they use it to make polycarbonates and urethanes. In 1982 a phosgene leak in their Bhopal, India, plant exposed 24 people, none of whom had been told to wear masks. Another leak in the Bhopal plant that year of methyl isocyanate (MIC) exposed 18 people.

A UC team in 1982 said the Bhopal plant was unsafe. An internal memo warned that a "runaway reaction could cause catastrophic failure of the storage tanks holding MIC gas". But UCIL did nothing and continued to cut corners. Bhopal had three MIC tanks housing 68,000 liters of liquid MIC.

In 1984 one tank with 42 tons of liquid MIC had water pumped into it. This caused a chemical reaction increasing the pressure inside the tank till it ruptured releasing the gas downwind over a two-hour period. A factory and town alarm sounded but the town alarm was soon turned off by employees, who escaped traveling upwind.

MIC is heavier than air so it clung to the ground. 600,000 people were exposed, 3,800 to 16,000 people were killed, and 40,000 disabled. Hospitals and temporary dispensaries treated 170,000 people. This was the world's worst industrial accident. The Soviets though managed to outdo UCIL in 1986. A meltdown in the Chernobyl nuclear power plant in Pripyat, Ukraine, led to an estimated 10,000 to 200,000 cancer deaths. An exclusion zone of 19-miles radius around Chernobyl persists and is estimated to be unsafe for humans for 20,000 years. The area has become forested, and concerns continue that a forest fire could result in further radiation release.

Pablo Bartholomew took an iconic photo "Bhopal gas disaster girl" (see opposite), for which he won the 1984 World Press Photo of the Year. To this day the girl's identity is unknown. 200,000 children were exposed to the gas.

The Indian government passed the Bhopal Gas Leak Act in 1985 authorizing the Indian government to represent all victims. Litigation in the US led to the US Court of Appeals who said UCIL was a separate entity, owned, managed and operated by Indian citizens in India. The US Supreme Court refused to hear an appeal of the lower courts precluding the pursuit of damages in US courts.

In 1986 UC offered \$350 million to victims. But the Indian government wanted \$3.3 billion. The Indian Supreme Court told UC and the Indian government to come to an agreement. They agreed on \$470 million in 1989. But UCIL had no money. Sequelae after exposure include chronic conjunctivitis, corneal scars and blindness, obstructive and restrictive pulmonary disease, memory impairment and post-traumatic stress disorder.

Two groups have opposed each other bitterly. This first group opined the disaster was corporate negligence. This is what the Indian government claim. The second group said this was worker sabotage. This is what UC claim. Indeed, analysis of how water could have got into the MIC tank showed it had to be an act of commission not an act of omission, i.e. sabotage, not neglect. The Indian government controlled all investigations and immediately took control of the plant after the gas spill. UCIL were not allowed in. In 2017 S.P. Choudhary, the MIC production manager at the time, said a disgruntled employee, M.L. Verma, sabotaged the plant by pumping water into the tank.



Bhopal gas disaster girl by Pablo Bartholomew



Bhopal memorial by Dutch artist Ruth Kupferschmidt for those killed and disabled by the 1984 toxic gas release.

The Indian government tried to say the spill was UC negligence, and that UC owned 51% of UCIL so were responsible. UC and the American courts tried to say UCIL was a separate entity managed and operated by Indians, and that the spill was sabotage. In 2010 Indian courts convicted seven employees of criminal negligence and fined them \$2,000 each. The US has denied several extradition requests from India for UC employees.

In 1985, a year after the Bhopal disaster, the US government founded the National Institute for Chemical Studies (NICS) to study the effects of chemicals on humans. The same year the EPA disclosed 28 incidents of MIC leak at the UC plant at Institute, West Virginia. Later that year UC disclosed there had been not 28, but 83 MIC leaks. EPA added that from 1980 to 1985 there had been 7,000 toxic chemical accidents from hundreds of companies, killing 135 people and injuring 1,500 people in the US.

GAF (General Aniline and Film) made a bid to take over UC in 1985, but rescinded the bid the next year. UC owned 700 plants, factories, labs, mines and mills around the world at the time. In 1986 UC divested itself of divisions involved with film packaging, metals, batteries, polymers, composites, home and automotive products and agricultural products. That year the US Congress enacted the Emergency Planning and Community Right-to-Know Act (EPCRA).

Despite such horrendous problems, corporate slice-and-dice operations started. In 1988 UC joint ventured with Allied-Signal. The next year UC Corporation became a holding company for Carbon products, industrial gases and the UC Chemicals and Plastics Company Inc. From 1990 to 1998, UC sold their divisions for producing urethane and propylene glycol. They bought Triton surfactant and an alkyl-phenol business, and spun off several independent businesses.

Finally, in 2001 Dow Chemical bought UC for \$11.6 billion. Industrialization has made life easier for humanity. But the cost from certain industries especially chemical, plastics and mining and refining industries has been very high. Union Carbide joined the DJIA 30 in 1928 and stayed there until 1999.

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By Luca Frediani uploaded by Simone.lippi, CC BY-SA 2.0,

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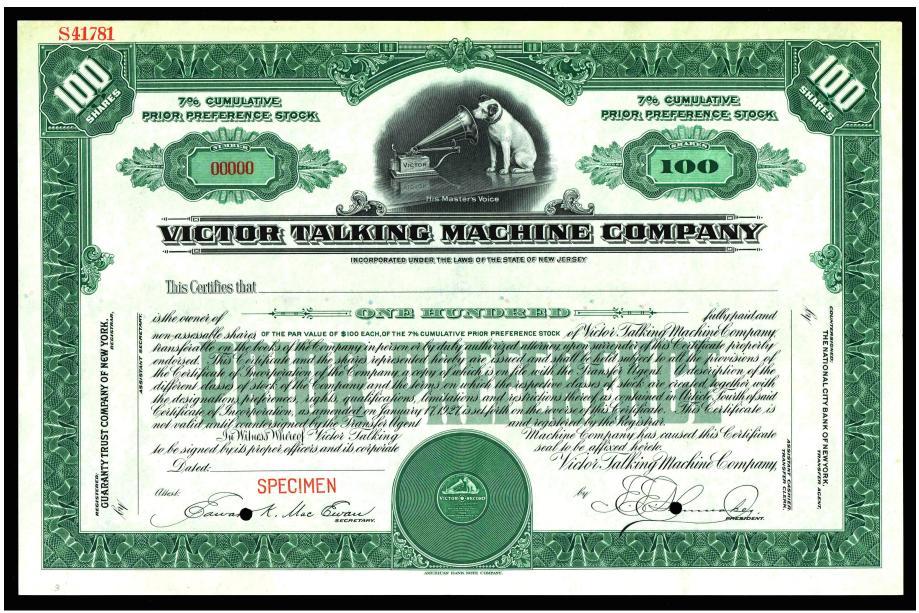
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By Theresa knott (original); Pbroks13 (redraw) -

http://en.wikipedia.org/wiki/Image:Limelight diagram.PNG, CC BY-SA 2.5,

https://commons.wikimedia.org/w/index.php?curid=4171671



#27. Victor Talking Machine Company Specimen Preferred Stock Certificate for 100 shares payable at 7% interest a year.

The company was incorporated in the State of New Jersey, and ABNCo printed the certificate. The certificate is hole and stamp cancelled with SPECIMEN and has the serial number 00000.

#2096.



Vignette of famous His Master's Voice logo with the dog "Nipper".



AMERICAN BANK NOTE COMPANY.

Nifty seal-like vignette made to look like a 78-rpm record.

One of my favorite stories is of Victor. There were four early phonograph inventors and developers:

- Edison,
- Bell and Tainter
- Berliner
- Johnson

Most people have only heard of Edison. He invented the phonograph in 1877 using metal foil cylinders. The needle vibration indenting the foil was up and down or "hill and valley" within the groove rather than sideways.



Edison with his first tin foil phonograph circa 1877.

Edison filed for US and British phonograph patents. But he soon became preoccupied with the incandescent lamp. In 1887 he resumed to his interest in phonographs, switching to wax cylinders, which Alexander Graham Bell and Sumner Tainter invented the previous year. Edison assigned many of his patents to the Edison Phonograph Company, which he then sold to Jesse H. Lippincott, who formed the North American Phonograph Company. This went bankrupt in 1891. In 1896 Edison repurchased their assets and founded the National Phonograph Company. However, manufacturers could not mass-produce his cylinders. They functioned better as Dictaphone like machine rather than for music – exactly what Edison had in mind in the first place.

Leon Douglas represented Edison at the Chicago World's Fair, making \$30,000 for Edison and \$3,000 for himself. He used this to start the Talking Machine Company of Chicago, which distributed Edison's phonographs from 1894 to 1904.

**Bell and Tainter**, who patented wax coated paper, formed the American Graphophone Company and produced machines at a small plant in Bridgeport, Connecticut. The exact composition of the wax was very important and was a closely guarded secret. Jesse Lippincott also bought Bell and Tainter.

The first recordings were single cylinders. Later, artists recorded in banks of four and later even 20 cylinders. They never developed mass stamping technology like Berliner and Johnson until after 1902. By that time Johnson was already technologically way ahead.

**Emile Berliner**, a German immigrant to America, invented the loose contact principle for Bell's telephone mouthpiece. He sold this to Bell for \$75,000 plus \$5,000 a year in royalties. Berliner also experimented with a flat phonograph record, using a metal disc coated with acid resistant material, which was cleared by recording stylus. This vibrated horizontally relative to the groove rather than Edison's cylinders, which vibrated up and down within the groove. Berliner could then immerse the discs in an acid bath to expose the groove. He stamped this with another disc to create a master die used to manufacture many records.

Berliner called this the Gramophone and assigned his patents to the US Gramophone Company in Harper's Ferry, West Virginia. In 1895 he patented his disc process and started the Berliner Gramophone Company of Philadelphia. The patent lasted 17 years. Initially, the disc was hand turned. However, even as a novelty, it performed poorly.



Emile Berliner (date unknown)



Eldridge Johnson (date unknown)

In 1896 **Eldridge Johnson** met with Berliner's machinist about improving a clockwork motor for the phonograph. Johnson became interested, and redesigned far superior motors.

Berliner's metal etched master dies and Eldridge Johnson's superior spring motors (with a governor for constant speed) made a vastly superior product. So Berliner and Johnson joined forces in 1896.

Their disc had a pre-made spiral groove so they needed no lateral tracking mechanism. The sound, though more crackly, was much louder than cylinders. In 1887 Berliner changed to recording on ink-covered glass. This was transferred to a photographic negative and then to a zinc plate coated with bichromated albumen, which reacted to light allowing zinc to be acid etched. Further improvements resulted in superior discs made of "imitation rubber".

Thus, by the 1890s the players were:

- Edison  $\rightarrow$  Lippincott  $\rightarrow$  Edison rebought  $\rightarrow$  Single cylinders
- Bell & Tainter → Lippincott → Edison bought → cylinders
- Berliner's gramophone discs mass produced

 $\rightarrow$  merged

• Johnson's steady motor, discs development

From 1896 to 1900, Berliner sold around 25,000 units using Johnson's motor. Johnson soon manufactured complete machines.

Johnson experimented with disc stamping, settling on a pre-grooved wax disc. The exact composition of the wax was very important. Once they made the recording, they made a fine electrotype from this, from which they made a male metal die. Electro-typing is a process that uses electricity to deposit metal on a mold, usually wax, then backing the shell with metal. Graphite powder on the wax acted as the electrical conductor. Johnson's electroplating method replaced Berliner's photoengraving method because of superior results in 1898.

Johnson's patent lawyers advised him to keep it secret and delay applying for a patent until it was perfected. He applied for one in 1898 and 1904 and a patent was awarded in 1908. Bell and Tainter's wax patent had expired in 1903.

Johnson had an agreement with Frank Seaman's National Gramophone Company to market his Berliner Gramophone. But Seaman constantly complained of poor profits. In 1897 Seaman sold the European patent rights to an Englishman, Trevor Williams, who set up The Gramophone Company. They paid Johnson \$15,000 for the rights and became his best customer.

In 1898 Seaman advertised a cheap take off of Johnson's Berliner, called the Zonophone. Johnson sued him for patent infringement. So, Seaman teamed up with the American Graphophone Company to harass Berliner and Johnson, hoping to deplete their financial resources. Johnson seemed to win most of the suits, but Berliner seemed to lose most of them. These suits cost Berliner and Johnson millions of dollars from 1898 to 1903.

Ultimately, Johnson emerged the victor. He started his own company, which he first named Consolidated Talking Machine Company. Seaman immediately sued him for using the word "talking machine" so Johnson switched to Eldridge Johnson Machine Company. In his first year in 1900 Johnson made \$180,000, much of it from sales to the Gramophone Company of London.

Then the Gramophone Company of London bought up Seaman's Zonophone Company. Johnson did not move against either. Instead, he simply bought up Zonophone and became the best he could be, realizing most of his sales were to the Gramophone Company of London, anyway.

In 1901 Johnson reorganized as the Victor Talking Machine Company (VTM) with 20,000 common shares and 5,000 preferred shares paying 7%. In doing so he bought out his own Eldridge Johnson Machine Company, which included the Berliner Gramophone Company he had bought from Berliner in 1900, in return for stock.

Francis Barraud was an English artist whose deceased brother had left him a dog and a phonograph. One day he found his dog "Nipper" listening to his deceased brother's phonograph and wondered if he was listening to his previous master's voice. So he called the picture "His Master's Voice" and sold it to the Gramophone Company of London for 100 pounds. He gave VTM permission to use it as a trademark.



Francis Barraud's painting "His Master's Voice" 1899.

Although Berliner was wealthy and originally had outside investors, Johnson replaced Berliner's motor and disc technology. In addition, Seaman and Easton's American Graphophone Company had crippled Berliner financially with their suits. So Johnson had Berliner travel to England to manage the

Gramophone Company of London. Johnson made Leon Douglas, a consummate marketer, his Vice President. And Johnson gave the Gramophone Company of London marketing rights in the British Empire and Europe. VTM's territory remained the US, South America, Mexico, the Near East and Far East.

In 1900 wax cylinders were state-of-the-art, but by 1901 Johnson's discs had become state-of-the-art. All the major retailers including music shops picked up these discs. VTM later made discs of varying diameters: 7", 10", 12", and 14". The machines sold for \$3 to \$60.

Yet another company, Columbia, tried competing with VTM and infringed their patents. Rather than sue, Johnson made a cross licensing arrangement with them to acquire a patent himself. VTM over its life spent 8.2% on advertising chiefly in newspapers and magazines. VTM's recording artists were the most famous and popular in their fields. Most had exclusive contracts with VTM. They called top-notch artists "Red Seal Artists" which was a mark of distinction. Other artists they called "Black Seal Artists".

VTM hired a recording engineer, Fred Gaisberg, whom he sent to Europe. One of the sensational new artists he contacted there was Enrico Caruso. Typically, VTM paid artists \$2 to \$4 for a one-disc recording. Caruso demanded £100 (\$484 at the time) for ten discs! VTM advised Fred to refuse it. Luckily, he did not. London Gramophone Company sold the records at a \$72,000 profit! VTM and Caruso developed a symbiotic relationship. Caruso became VTM's top star and ultimately made \$3 million from VTM, and VTM made millions from him.

The public became interested in serious music. Even popular music fans had a few Caruso records. Caruso's stardom propelled VTM to become the Cadillac of talking machines. Caruso was also a coin collector. His collection of ancient and gold coins sold in 1923. According to the E-sylum, a numismatic website: When a courtier told Italian King Victor Emmanuel that Caruso had just acquired a particularly fine specimen of a rare Roman gold coin, he remarked with a sigh, "If I were Caruso then I too could afford to buy such a coin"!

Interestingly the frequency response of these mechanical players closely matched the frequency range of the baritone voice. Once a month a new record list came out. No dealer could sell new records before then. Millions of people eagerly anticipated the list every month. Red Label artists sometimes demanded advance royalties that Johnson knew they would never make. But the shrewd Johnson happily paid them. He knew the artist enhanced VTM's reputation more than the extra money they asked. It also kept the artists in the fold: as an exclusive artist they could not record for anyone else.

VTM had exclusive contracts with Caruso, Heifetz, Kreisler, Paderewski, Rachmaninoff and Toscanini. In the early days there was an emphasis on classical music. Johnson later introduced jazz and blues records like "The Memphis Blues". He also recorded Jimmie Rodgers and the Carter family, the founders of country music. VTM had scouts who identified both of them before any others in 1927. Souza band music was also popular. People soon started calling VTM just Victor.

The top four records in the early days (1901 to 1910) were:

- Verdi's Aria from "La Forza del Destino", a duet by Caruso and Scotti in 1906
- Verdi's Rigoletto Quartet "Bella Figlia Dell' Amore" by Caruso, Scotti, Abbot and Homer in 1907 which sold for \$6 for a one sided record.
- A sextet from Donizetti's "Lucia di Lammermoor" by Caruso, Scotti, Sembrich, Journet, Severina and Daddi in 1908, which sold for \$7.
   People affectionately called this the "Seven Dollar Sextet"
- Verdi's Miserere from "Il Trovatore" by Caruso and Alda, with the Metropolitan Opera Chorus in 1910 which sold for \$4.

I am not an opera aficionado but I truly enjoyed listening to all of these on YouTube. The recordings are somewhat more dramatic than today's performances and average four minutes. However, the remarkable thing is their fidelity, virtuosity and a feeling of grandeur; and the thought that 100 years ago people played them in their own homes. The other interesting thing is the poor bass response, despite otherwise great fidelity (this would be exploited later). The second record is the finest in my opinion.



Enrico Caruso (1873-1921) and his wife, the former Miss Dorothy Park Benjamin (1893-1955), with their daughter, Gloria Caruso (1919-1999).



VTM gave Caruso this customized Victrola as a wedding gift in 1918; he died three years later aged 48 from an abdominal abscess.

In the 19-teens, Top of the Pops pieces were more eclectic:

- Caruso O Sole Mio
- Elman Souvenir
- Lauder Roamin' in the Gloamin'
- Gluck Carry Me Back to Old Virginny
- Rachmaninoff Prelude in C# minor
- Kreisler Lieberslied

- Gluck and Zimbalist Fiddle and I
- Homer and Gluck Whispering Hope
- McCormack Mother Machree
- Heifetz Ave Maria

Victor later also made singer training sets, foreign language phrase sets, and music appreciation sets.

In 1904 Victor's factory caught fire, but Johnson had insured it and quickly rebuilt it. Two years later, Johnson paid \$800,000 for Berliner's 8,000 shares. Berliner felt Victor was shaky at the time. He wanted to cash out while the going was good. Had he only waited till 1921, his shares would have been worth \$10 million!



Victor Talking machine with exposed horn.

Until 1906 all "Talking Machines" had exposed horns (see above). But that year they introduced the "Victrola", an enclosed floating horn two years in the making. Victrolas sold for \$15 to \$600 – a huge price at the time. Johnson wanted a product that looked more like a real musical instrument, hence the furniture look. The sound was the same; you were paying for the image. Victor cabinets were carefully carved, by machine or by hand. Varnishing took 18-24 days. (See Caruso's custom Victrola opposite). In 1907 Victor sold 3,559 concealed horns (Victrolas) and 98,308 exposed horns. By 1915 they sold 374,191 Victrolas and only 3,946 exposed horns. They had marketed well!

Again, Columbia manufactured a copycat version called the Grafanola (sounds like breakfast cereal!) Again, Johnson simply cross-licensed them.

In 1908 Columbia issued double-sided records forcing Victor's hand to do the same. Victor offered exchanges for stock single side records.

Victor had courses in salesmanship, elaborate window displays and a house organ called "The Voice of Victor". They also published "How to Get the Most out of your Victrola" to try to cultivate record sales. VTM set up sales training seminars in Camden, NJ, where their factory was located. Each class lasted two weeks with 25 students. Classes were free. The distributers and retailers paid for the student's travel and housing. This was all part of VTM's vertical integration, which included very sophisticated marketing for the era.

Victor also printed its own record catalogs, record labels and sleeves, talking machine catalogs and office forms. Additionally, they had a department of 20-30 traveling marketing experts who helped dealers increase their sales volume any way they could.

In 1911 Victor established an Educational Department under Mrs. Frances Elliott Clark, a previous Public School Music Supervisor. She cultivated a traveling program with lectures and demonstrations. She also organized special records collections especially of classical music.

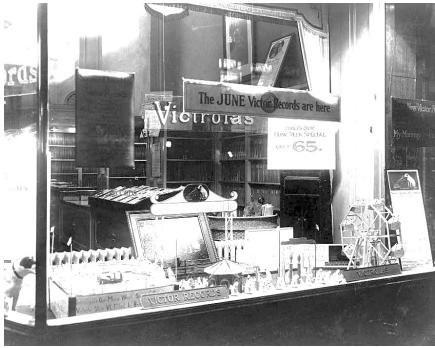
Also in 1911, Johnson increased the capital of VTM from 20,000 to 50,0000 shares. He winded up owning 50% of the company. Two years later Victor made an electric motor option for its otherwise purely mechanical Victrola. Johnson established an Employee Beneficial Association, insuring employees for days off sick, life insurance and nursing services. He used Travelers Insurance Company and matched employee contributions dollar-for-dollar. Later he added a pension scheme.

During the First World War Victor switched to aircraft, rifle and munitions manufacture. Talking machine production decreased, but by 1919 production was going full bore again. By then the US government charged a 3% excise tax and another 5% luxury tax on Victor's items.

By 1915 Ford's Model T Runabout retailed for \$345. Victrola's top model sold for \$300! Unskilled laborers then made 20 cents an hour or \$2 a day. By 1916 Victor had 6,043 dealers, and 103 distributors. In 1917 Victor produced 573,000 phonographs, some retailing for up to \$900! They forbade pricecutting. But the US Supreme Court ruled against this prohibition in 1919. By the early 1920s sales were \$46 million a year.

Early on Victor recommended that steel needles be changed every time a record was played as it developed a face, which would impair the record with subsequent use. I suspect that most ignored this advice! But in 1916 Victor introduced a tungsten steel needle that could be reused. Later they introduced jeweled styli.

Each summer Victor had a business convention in Atlantic City. In 1920 Caruso and Rachmaninoff, and the Victor Orchestra (also called the Philadelphia Orchestra) entertained them live at the convention.



Victrola store in Washington DC 1921. Note shelves of records, the enticing model displays, the announcement that June's latest recordings were in, a special cabinet Victrola for \$65 and even a model of "Nipper" on the left.

Victor's main competitor was the Columbia Company that Victor had earlier cross-licensed. Columbia issued capital stock around 1916, which ran up to \$65 producing an untenable capitalization of \$100 million. Then in 1921 the stock dropped to \$5. I recall the Hi-Fi craze of the 1960s and 1970s. This meant extensive research into the best speakers, receivers and record players, and a library of records that reflected your taste and spoke to collector interests. No doubt Victor buyers followed similar instincts from the turn of the century except that it was even more novel.

Victor did well in from 1920 to 1923. But in 1924 the radio craze started to displace records. Instead of doing the obvious – creating a combined radio and record player with even better speakers - Victor decided on an advertising blitz to sell inventory. After this failed, Victor in 1925 sold its huge inventory at 50% off to distributors, losing money.

Then Victor saw the light and signed up with RCA for a radio chassis to produce their first electric speakers and microphone rather than mechanical recordings. This was their first non-mechanical phonograph, which they called the Orthophonic Victrola. You could still hand wind them but they also came with electric motors. The Credenza Orthophonic Victrola sold for \$300. With more marketing blitzes they sold 67,000 of these and many more of their 19 different models ranging from \$17 to \$1,000. By late 1926 Victor's 1925 losses had been regained. By this time popular songs were more common than classical. Another competitor, Brunswick, embraced electrical speakers before Victrola in 1925, but by 1926 Victrola had 20 electrical units called Electrolas, retailing from \$195 to \$1,750. Victrola sold 270,262 units. Victrolas played records acoustically, Electrolas played them electrically, and Radiolas included a radio. In 1927 Victor invented the first automatic record changer. Many Radiola owners said their 1929 models were so good that ten years later they were still second to none.

In 1926 Johnson sold his stock for \$23 million getting out at the peak of the market. He had masterminded a huge vertically integrated company. He was an early proponent of MBWA (management by walking around). Between 1900 and 1929 Victor had \$700 million in sales of which \$413 million were for "instruments", \$272 million were records and \$15 million for parts, needles, etc. They sold eight million instruments and 591 million records, an average of 74 records per customer. Victor had dominated the industry for 30 years.

In 1929 RCA bought out VTM which briefly became the Radio-Victor Division of RCA and finally in 1968 RCA Records. RCA also marketed the Victrola brand till the late 1960s. Not only did VTM control the US but also England's Gramophone Company (which became EMI and HMV); Gramophone Company of Canada; Deutsche Gramophone; and Japan Victor Co (JVC), which left RCA during the Second World War and became an electronics giant.

In 2011 the Library of Congress and Sony Music launched the National Jukebox. This produces streaming audio for over 10,000 pre 1925 records. The Johnson Victrola Museum in Dover, Delaware displays VTM history. VTM was only in DJIA 30 for one year in 1928.

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https://ethw.org/Victor Talking Machine Company

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By Francis Barraud - Victor Talking Machine Company, Public Domain,

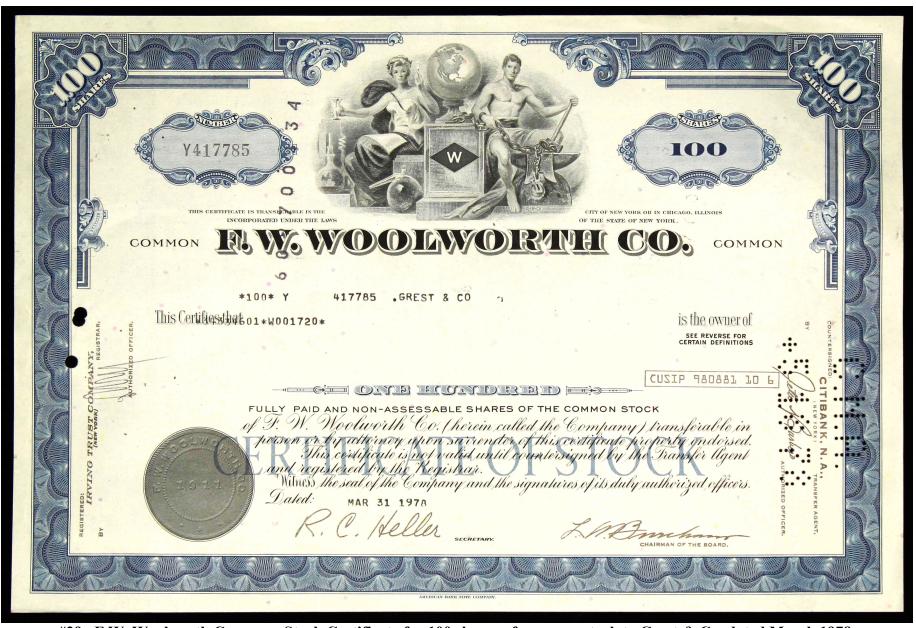
https://commons.wikimedia.org/w/index.php?curid=1793229

By self - Own work, CC BY-SA 2.5, https://commons.wikimedia.org/w/index.php?curid=3815087

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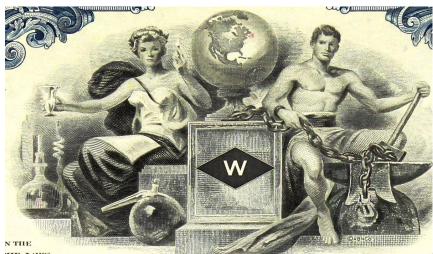
https://www.loc.gov/resource/cph.3c17298/



#29. F.W. Woolworth Company Stock Certificate for 100 shares of common stock to Grest & Co. dated March 1978.

Hole and punch cancelled C.N.A. | +5 18 78. Woolworth was incorporated in New York State,

the seal does not specify this, just the year 1911. ABNCo printed the certificate. #1965



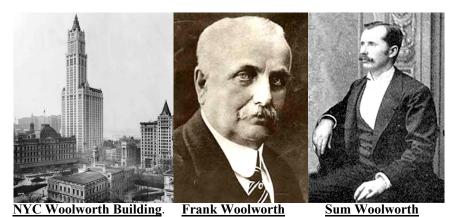
Vignette of allegory of chemistry left and of manufacturing right. Between them is a globe of the world on a "W' pedestal below.

Frank Winfield Woolworth (1852-1919) pioneered Five-and-Dime Stores, (or Dime Stores). The modern equivalent is the dollar store. He introduced several innovations: direct purchase from manufacturers without using distributors; self-service, doing away with sales clerks behind counters to hand you the goods; and low prices which undercut competitors. I recall in the 1960s, when I went to Cambridge as a student, shopping mainly at Woolworths because prices were better. I also shopped at Sainsbury's, a traditional counter-and-sales-clerk store, that made you stand in line many times to pick up each group of items from clerks! One counter for cheese, one for canned goods, one for bread etc.

After two failed stores, Frances ("Frank") opened a successful Woolworths store in Lancaster, Pennsylvania. He asked his brother Charles Sumner ("Sum") to help him manage a second store. After two further failures they finally got it right at Scranton, Pennsylvania. Sum did a lot of MBWA (management by walking around), cultivating the nickel and dime merchandising model. Sum then opened another branch with a friend Fred Kirby in Wilkes Barre, Pennsylvania. Sum preferred mahogany counters with glass dividers and highly polished wood floors, which became standard. Two more relatives then joined the syndicate to maximize purchasing power.

By 1904 Frank had six chains of 120 affiliated stores in 21 states. The next year he incorporated as Woolworths Inc. In 1912 Frank persuaded his relatives and friends to incorporate under F.W. Woolworth Company, merging with four of his early syndicators. This included 596 stores and raised over \$30 million for the four founders and himself.

Frank traveled to Liverpool, England where he opened a store in 1909. Within a generation England had over 500 Woolworths stores. However, England did not abandon traditional counters and sales assistants till 1955. Their Liverpool store later introduced a lunch counter that served as a gathering place like modern shopping mall food courts. The lunch counter idea spread to the US. This was all part of their merchandising formula.



In 1910 Frank commissioned the Woolworth building in New York City, completed in 1913. It was the tallest building in the world until 1930 and was used as Woolworth's headquarters then its successor's, Venator. Frank loved to make unannounced visits and shop lift in his stores, to test whether staffs were

attentive! If they caught him, he rewarded them with money or promotions!

When Frank died in 1919 his net worth was \$76 million. His brother Sum, a modest man, took control. They asked him to be president. But he preferred to work in a low key, non-confrontational way behind the scenes as Chairman, which he did very effectively. By 1929 Woolworths had around 2,250 stores worldwide.

In 1932 Woolworths added a 20-cent line of merchandise and in 1935 stopped setting price limits entirely. Sum stepped down in 1944 and died in 1947.

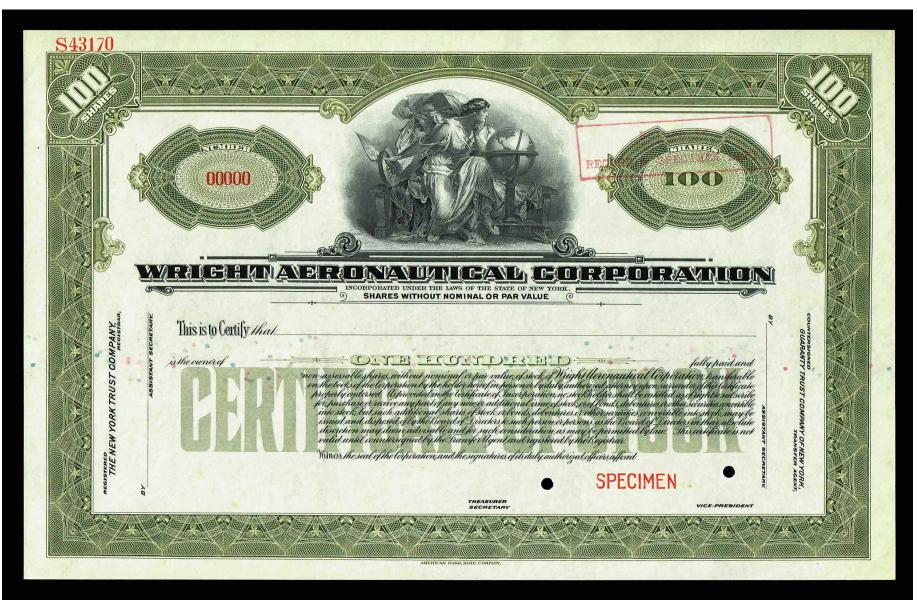
In the early 1960s US competitors K-Mart, Target and Wal-Mart started. Woolworth found, like most companies over their lifespan, that their formula declined in profitability. At peak they had over 8,000 stores, the largest store chain in the world. In 1993 Woolworths closed half of its 800+ general merchandise stores in the US. Four years later Wal-Mart replaced Woolworths in the DJIA 30 and Woolworths closed all remaining US stores, changing its name to Venator, specializing in its only profitable line - sportswear. In 1999 Venator sold the New York City Woolworth building and in 2001 changed their name to Foot Locker Inc.

In England, Woolworths became part of retail giant Kingfisher, who floated them as a separate company in 2001. They declined as shoppers found them dated. Some Woolworth stores persisted in Austria, Germany and Mexico, and until 2009 in UK. Australia and South Africa Woolworths stores have no relation to the original Woolworths. Woolworths was in the DJIA 30 from 1924 to 1996.

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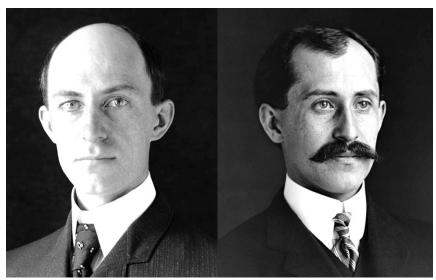


#30. Wright Aeronautical Corporation Specimen stock certificate for 100 shares of common stock, undated and unissued. The certificate is hole cancelled and stamped SPECIMEN. Serial number is 00000. It is printed by ABNCo.

Note the multi-colored planchette inclusions in the paper, which is a security device. #2109

Orville Wright (1871-1948) and Wilbur Wright (1867-1912) built the first powered airplane capable of controlled flight in 1903.

They were two of seven children. Neither married and neither finished high school. In 1889 they started a newspaper and printing business. During the 1892 bicycle craze they opened a bicycle repair shop in Dayton, Ohio, and four years later manufactured their own bicycle brand. In the mid-1890s they started experimenting with aviation, funded by their cycle business. Wilbur was the dominant and older of the two brothers.



Wilbur Wright (1867-1912)

**Orville Wright (1871-1948)** 

The three parts of a plane are: wings for lift, engines for power, and controls for safety. The brothers believed that the wing and engine problem had already been solved but not the control problem.

At first, they flew the planes as kites with string controls. They observed that if they warped wings down, it caused banking, which they could correct by unwarping. Choosing Kitty Hawk, NC, in 1900 as it had regular breezes and soft sandy landing surfaces, it gave them plenty of privacy from reporters. They set up camp there each summer traveling by train and steamer from Dayton.

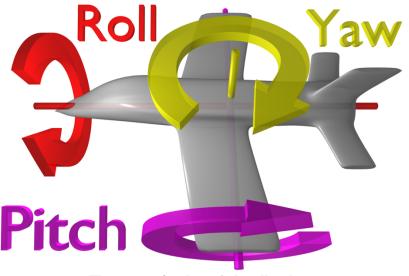
Their friend and French-born US aviation pioneer Octave Chanute (1832-1910) had found reporters very troublesome. Chanute visited the brothers regularly to talk shop, and it was his designs of wings – a biplane that the Wright brothers copied. The design included the airfoil to give lift. Sir George Cayley (1773-1857), the father of aviation, discovered the airfoil. If air travels further over the top than the bottom of a wing this creates lift.

During experiments Wilbur did the manned gliding, as he did not want to have to explain to his father if his younger brother got injured. They put an elevator (like a flap) in front of the wings in case the glider nose-dived and killed its occupant as had happened to Lilienthal in 1896. The elevator controlled pitch (up or down).



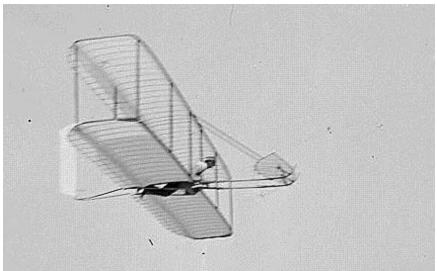
1901 Wright glider, note elevator in front, no rudder behind, and airfoil.

Otto Lilienthal had calculated a lift equation showing lift was related to wing area, velocity, wing shape, and a constant related to air pressure. The brothers built a wind tunnel and tested 200 different wing shapes and airfoil curves, showing the benefit of long thin wings, which gave less drag and more lift. They found a flatter airfoil gave more lift. This led to a new glider in 1902 with a fixed rear vertical rudder which controlled yaw induced by wing warping. Wing warping meant one wing twisted up and the other wing twisted down to cause banking or roll (modern airplanes use flaps instead).



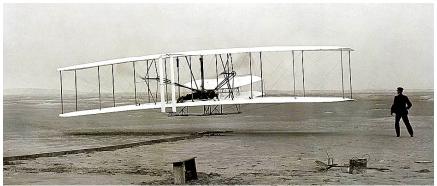
Three axes of a plane pitch, roll and yaw.

The three axes of a plane are pitch (pointing up or down), roll (right or left wing down), and yaw (nose right or left). The Wright brother's main discovery was that the function of the rudder was not to turn, but to control adverse yaw while banking to turn. Adverse yaw is the tendency of a plane to go into a tailspin when banking e.g. if you roll right (right wing down) you tend to yaw left causing a tailspin.



1902 Wright glider showing elevator in front and rudder behind.

Many experts feel that their discovery of how to control a glider in 1902 was a more important invention than motorized flight. The next year, the brothers put together a powered plane called the Wright Flyer I using spruce and muslin. They hand carved laminated spruce propellers that they tested extensively in their wind tunnel. The propellers were 8-foot long twin pushing propellers (i.e. behind the plane) rotating in opposite directions to counter torque.



Wright Flyer I December 1903 picture of the first controlled motorized flight, Orville piloting, Wilbur at right. Note launching rail to left, larger elevators, same rudder, push propellers behind plane and skid below.

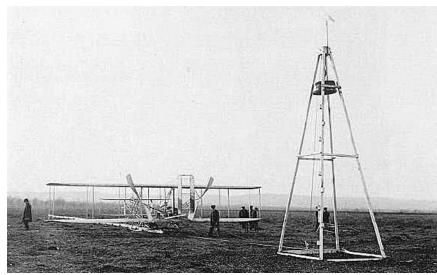
The brothers could not find engine manufacturers to make a light enough engine. But their bicycle shop mechanic, Charlie Taylor, built a 12-horse power engine, casting the engine block in aluminum (in those days engine blocks were all iron). The engine, weighing 180 pounds, turned the two propellers by sprocket drive chains used for automobiles. Its wingspan was 40 feet, and weight was 605 pounds total. It cost them \$1,000.

That same year the government gave Prof. Langley of the Smithsonian a grant of \$50,000 to build a plane called the "Great Aerodrome". This crashed both times it was launched in 1903. Later trials showed it could never have flown.

In December 1903 the brothers made several flights; the longest was 852 feet with five witnesses present. One of them photographed the flight (shown left bottom). The plane is now on display in the Smithsonian (more about that later).

The next year the brothers built the Wright Flyer II. To avoid the expense of carting themselves and their equipment from Dayton to Kitty Hawk, they set up a rent-free airfield in Huffman Prairie, eight miles from Dayton.

They invited reporters, but failed to fly. The reporters lost interest and stopped coming - much to the Wright brother's pleasure! Some have suggested the failures were intentional! The lighter winds made take offs more difficult, so they constructed a longer starting rail than the 60-foot Kitty hawk rail (still pointing into the wind), and used a weight powered catapult (shown below).



Wright Flyer II with Derek weight powered catapult and rail.

In September 1904 Wilbur flew the first complete circle covering 4080 feet in 90 seconds (31 mph). By year's end they had flown a three-mile trip in five minutes flying almost four circles.



Wright Flyer III 1905, note larger elevators, rudder, and two seats.

In 1905 they built the Wright Flyer III installing a separate rudder control (previously it had been linked to the wing warp control) with a larger rudder and elevator. This markedly improved maneuverability. Wilbur flew 24.5 miles in 38 minutes.

Eschewing reporters had its advantages. But it also had its disadvantages. In 1906 the Paris Herald Tribune ran an article called "Fliers or Liars?" The brothers had not taken out any patents and refused to sell, fly or even show a picture of an aircraft unless they had a signed contract. Their first patent (that they wrote themselves in 1903) was rejected, so in 1904 they hired a lawyer who filed for a patent that was finally granted in 1906.

In 1906 and 1907 they tried to persuade the US government to buy their planes. The government was dismissive. So the brothers took their Model A Flyer to France anticipating a demonstration. There they met US Lt. Frank Lahm, who arranged for them to make a presentation to the US Army Signal Corps in 1907.

Wilbur gave a demonstration in France, stunning the previously ridiculing French aviators and press. The Wright brothers became an overnight sensation. In 1908 Orville demonstrated a one hour-long flight to the US army at Fort Myer, Virginia (film available on YouTube). But on one of his flights a propeller split sending the Flyer out of control killing his passenger. Orville fractured his leg and four ribs and spent seven weeks in the hospital. His sister, Katherine, rushed from Dayton to Virginia and helped negotiate a one-year extension to the army contract. She stayed by Orville's side for seven weeks.

After his recovery Orville toured France and Italy in 1909 giving demonstrations with Wilbur and Katherine. They sold their plane to the US Signal Corps for \$30,000. That year they incorporated as the Wright Company. They sold their patents to the company for \$100,000 and received one third of the \$1 million of shares issued and claimed a 10% royalty on every plane sold. It does not sound like much, but US laborers averaged \$400 a year in 1909.

They set up a factory for their Model A Flyer in Dayton and set up a flying school. In 1910 they made the Model B, in which they moved the elevator to the back, and added wheels. They trained 115 pilots over six years, one of whom was Henry Arnold who became a five-star General and the top commander of the US Air Force.

Another competing aviator named Glenn Curtiss devised ailerons to simulate wing warping which accomplished basically the same thing – one flap went up and the other side went down – this was the same as a wing warp. With this invention Curtiss refused to pay licensing fees to the brothers. The brothers sued him successfully, finally winning in 1913. But Wilbur, who had been leading the patent struggle, died of typhoid fever in 1912. Further, by 1913, eleven US Army pilots had died in Wright airplane crashes because of their tendency to nose dive. The government stopped buying planes from the brothers feeling that tractor rather than pusher propellers would do better. But the brothers feared changing the propellers could affect the patent fight with Curtiss.

Orville and Wilbur had planned a family home, Hawthorne Hill House, for themselves, Katherine and their father, in Oakville, a suburb of Dayton, OH. But the home was not completed until 1914, long after Wilbur died.



Hawthorne Hill House completed in 1914 in Oakwood, a Dayton suburb.

Unfortunately, the Wright brother's preoccupation with patent protection stopped US aeronautical progress. Consequently, by the beginning of the First World War (1914-1918) the French had better planes than the Americans. In 1917, the US government forced the industry to form a cross licensing body the "Manufacturers Aircraft Association". Member companies paid a blanket fee to use all aviation patents. This solved the patent problem.

In 1915 Orville sold the Wright Company and spent the rest of his life as a sort of senior statesman of aeronautics. Glenn Martin bought the Wright Company in 1916 and formed the Wright-Martin Company. The company received \$2 million for patent payments. Martin later resigned to form the Glenn Martin Company (later becoming Lockheed-Martin). Wright-Martin then renamed itself Wright-Aeronautical in 1919.

In 1923 Wright-Aeronautical bought the Lawrence Aero Engine Company. Two years later Fred Rentschler, an aerospace engineer, President of Wright-Aeronautical, left the company to form Pratt and Whitney Corporation.

In 1929 Curtiss Airplane and Motor Company joined Wright Aeronautical to become Curtiss-Wright Corporation, capitalized at \$75 million. Curtiss had been Wright's first competitor. During the Great Depression the US military kept Curtiss-Wright afloat. Curtiss-Wright had three divisions, one for airplanes, one for engines and one for propellers. They called most aircraft, Curtiss, and most engines Wright. During the Second World War (1939-1945) they made 142,840 aircraft engines, 146,468 propellers and 29,269 airplanes. They ranked second behind GM for wartime production. By the end of the war Curtiss-Wright was the largest plane manufacturer in the US, supplying the US Air Force.

Unfortunately, Curtiss-Wright made defective engines, which they had passed by crooked inspectors. The inspectors were later convicted after assembly worker whistleblowers acted. Curtiss-Wright also failed in research and development. They stuck to conventional engines and never got into jets. Northrup soon overtook them. Curtiss-Wright survived as a mid-cap component manufacturer specializing in actuators, aircraft controls, etc.

Thus, the sequence was:

Wright Company → Wright-Martin → Wright Aeronautical → Curtiss-Wright 1909-1915 1916 1919

A curious sideline to the history of flight was the Smithsonian's smug behavior. Prof Langley's 1903 \$50,000 "Great Aerodrome" plane crashed twice and never flew. But for some reason the Smithsonian put this plane, not the Wright Flyer I, in their museum as the first plane. They labeled it "capable of flight". Curtiss climbed into bed with the Smithsonian later making major modifications to the Aerodrome until he could get it to fly, hoping to defeat Wright's patents.

Orville therefore donated the Wright Flyer I to the London Science Museum in 1928 because the Smithsonian continued pretending Langley's Aerodrome was first in flight. Charles Lindbergh also tried (unsuccessfully) to get the Smithsonian to see the light. But it was Fred C. Kelly, the Wrights biographer, who finally knocked sense into them in 1942. The Smithsonian then "fessed up" about Curtiss's modifications and how it never was "capable of flight". After that Orville asked London to send the Flyer I to the Smithsonian. They finally put it on display in 1948, but only after he died. Puzzling!

Another personal detail, which fascinates me is that, neither brother ever married. Wilbur once said "I don't have time for both a wife and an airplane". Orville's sister, Katherine, was the only sister who lived past infancy. She taught high school until she left her job to care for Orville in hospital after his accident. She often wrote to her brothers updating them about home life and life in Dayton, warning them while in Europe of "distractions". Traveling with them in Europe in 1909, she became a celebrity and dominated press interviews with her charm. She received the Legion d'honneur along with her brothers. In 1914 she, Orville, and their father moved to their newly constructed mansion in Dayton. Increasingly she became Orville's business and social secretary. In 1920 she started writing to an old college boyfriend whom she married in 1926.

Orville was heartbroken and refused to speak to her ever again. Two years later she fell ill with pneumonia. Orville still refused to see her, until pushed by another brother, Lorin. Orville finally went to her bedside where she died. She too had grieved over her broken relationship with Orville. Orville may have had a deep love for his brother, but he had an even deeper love for his sister.



Katherine Wright in 1896.

License plates in North Carolina read "First in Flight". In Ohio they read "Birthplace of Aviation". Both state quarters show the Wright Flyer I.

I urge you to look at the early films of the Wrights flying their planes on YouTube. One shows a flight in 1908, and another shows the Fort Myer, VA test flight with Orville sitting beside Lt. Frank Lahm, who helped him get the demonstration to the US Army. The film shows men lifting the counterweight by a system of pulleys. Half a dozen men pulled the rope away from the derrick to prime it. People moved the plane around by detachable wheels. The skid was obviously much lighter and saved on weight.

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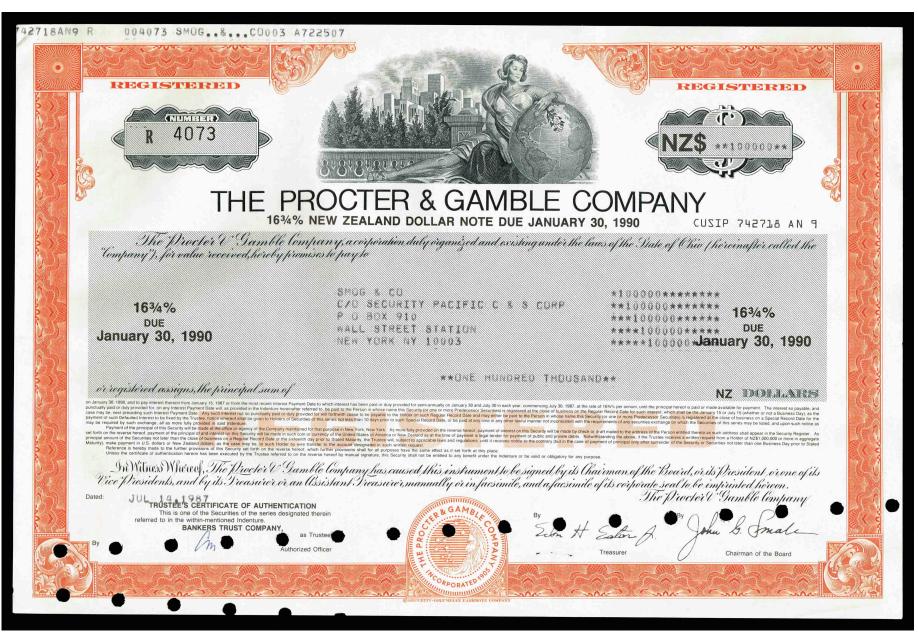
# **CHAPTER SEVEN**

# The thirty longest surviving stocks in DJIA.

The 30 Longest surviving stocks in DJIA are: (asterisk means not discussed before)

- 1. **GE**
- 2. Tennessee Coal Iron and Railroad later US Steel
- 3. Texas
- 4. Westinghouse
- 5. **GM**
- 6. Standard Oil later EXXON
- 7. A T & T
- 8. Proctor and Gamble \*
- 9. American Can
- 10. Sears Roebuck
- 11. Woolworth
- 12. Honeywell \*
- 13. United Aircraft / United Technology \*
- 14. DuPont \*
- 15. Bethlehem Steel
- 16. Union Carbide
- 17. Eastman Kodak \*
- 18. Chevron \*
- 19. International Harvester
- 20. Goodyear \*
- 21. American Smelting
- 22. International Nickel
- 23. Postum later General Foods
- 24. ALCOA \*
- 25. Chrysler
- 26. Johns Manville \*
- 27. International Paper \*
- 28. Owens Illinois \*
- 29. American Tobacco
- 30. American Sugar later Domino

Eleven of these stocks I have not discussed before. Some did not even exist when the DJIA 30 was formed in 1928 and I want to give fair exposure to the truly great companies in American history. I will now discuss those eleven companies.



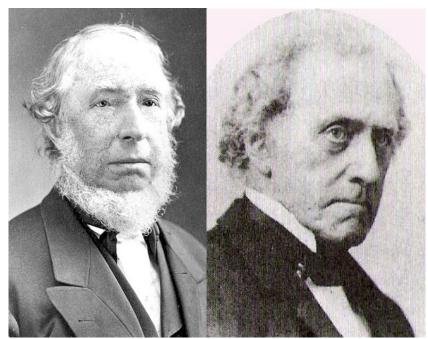
#8. Proctor and Gamble 100,000 NZ\$, New Zealand Bond at 16 ¾ % issued to Smog & Co., dated July 1987 and due 1/10/1990.

Machine Punch Cancelled. Printed by Security-Columbian Banknote Company. #2053



Vignette of reclining female, arm resting on globe, city in background

The history of Procter and Gamble (P&G) starts with the chemistry of fats. William Procter (1801-1884), an English clothing dealer immigrated to America in 1830 and learnt candle making in New York City. A person who makes candles is a chandler. He decided to move west but when he reached Cincinnati, OH, his wife fell ill, and so he stopped over. Unfortunately, she died. In his grief he stayed there though later remarried.



William Procter (chandler)

James Gamble (soaper)

In 1819 James Gamble (1803-1891) emigrated from Northern Ireland to Cincinnati, OH, with his parents. He apprenticed as a soap maker. A person who makes soap is a soaper. Like Procter, his family had intended to travel west but James became ill and his family ended up staying in Cincinnati.

James Gamble and William Procter both happened to marry two sisters, Olivia and Elizabeth Norris. One day the sisters' father sat the two boys down and told them they should go into business together. In 1837 they each pledged \$3,600 to start a partnership they called Procter and Gamble. In 1837 a laborer made six cents an hour, around \$180 a year for a 60-hour week. The two brother-in-laws' other connection was oil and fat. Oils are liquid at room temperature; fats are solid at room temperature.

A chemical reaction between oils and fats (like lard), with sodium hydroxide (lye) creates soap. When the two combine they form soap and water. They call the process saponification.

Candles are also made from fats. In the Middle Ages they used **tallow**. Tallow is fat from cattle and sheep. By contrast, **suet** is the hard white fat from cattle and sheep. **Lard** is from pigs. These fats made candles that were smelly. And they melted during the hot summer months from the glycerin in the fat. Beeswax was not smelly, and did not melt in hot weather but was much more expensive. Spermaceti whale fat was also not smelly when burnt. It was harder and burned brighter.

In 1800 colza oil was discovered, obtained from rapeseed, which made good candles. In 1825 French chemists patented stearin (which was tallow without the glycerin and much harder). This too burnt brightly and was not smelly. Around 1855 paraffin wax was first distilled from coal and shale oils in England. This too burnt brightly and was odorless. By the late 1800s most candles were a mixture of paraffin wax and stearin. (Incidentally in the 1970s rapeseed was crossbred to remove glucosinolates and erucic acid, which were considered toxic, making it edible. They named the new <u>Can</u>adian <u>oil</u> plant **Canol**a).

By 1859 P&G sales reached \$1 million. Their early trademark was a moon face and 13 stars (for the 13 original states) seen on the certificate (see blowup next page). After accusations that this was a satanic symbol the design was dropped in 1985.

During the Civil War P&G got several contracts to supply soap and candles to Union soldiers. Having been introduced to these products, soldiers naturally wanted them when they returned home after the war. Procter and Gamble

always took the long view and knew that low priced soap and candles during the civil war would expand their brand recognition.

Gamble's son trained as a chemist and in 1879 developed a cheap soap to compete with Castile (soap made from olive oil not animal oils). He called it Ivory soap after a passage in the Bible "the whole house is filled with the aroma of these garments, which smell of myrrh, and aloes, and cassia, out of the ivory palaces". The new soap was the first to float in water, making it easier to find in the bath! In 1882 P&G allocated \$11,000 for advertising Ivory soap.



Previous P&G trademark. Taken from the above bond.

After an 1884 fire in their Cincinnati factory they built a new factory in 1886. At the time there was a lot of worker unrest so the next year the brothers decided on a profit sharing scheme for employees making them part owners of the business. This prevented employee strikes very well. Three years later P&G changed from a partnership to a corporation. The same year they opened their first research lab in Cincinnati. Around this time people were using more and more kerosene lamps and incandescent light bulbs, depressing candle sales. So P&G sought other fat based products to sell.

How does a company that produces oil and fat products expand? Soap was for bathing and washing. Liquid soap was for shampooing; soap flakes were for washing machines. And while they were about it why not make granulated soap powders, and liquid laundry soap? Toothpaste also included soap, so why not add floss, toothbrushes, and other dental products? And if they were producing grooming products, why not add deodorants, shaving products, etc.? And this was largely how P&G developed.

In 1911 they started producing Crisco, a hard, lard-like fat used for cooking made form cottonseed oil rather than animal fats. In the 1960s until 2000 vegetable oils were felt to be much better for you than animal fats, so they enjoyed popularity. Later, P&G switched the recipe to soybean oil. But both cottonseed and soybean oils were high in trans fats, now recognized to be bad for you. Crisco's recipe has now been modified so that it contains less than 0.5 grams of trans fats per serving. This means that under US labeling laws they can declare it low in trans fats.

In 1915 P&G opened their first overseas manufacturing plant in Canada. Four years later, they found that seasonal soap buying by distributors was disrupting their plant manufacturing. So they ditched outside distributors and hired 450 salesmen to deal directly with retailers.

In 1924 P&G started a market research department and two years later came out with a perfumed beauty soap called Camay. In 1930 they bought Hedley and Co. in England, a large soap manufacturer who made Fairy soap. This started their expansion abroad. In 1933 P&G made their first synthetic soap, Dreft. They make soap from natural ingredients, if you can call lye natural! By contrast, they make detergents from synthetic ingredients. Lye is sodium and potassium hydroxide made from soaking hardwood ash in hot water.

In 1923 Crisco sponsored cooking shows on the radio. Ten years later P&G's Oxydol soap powder sponsored a radio serial called "Ma Perkins". This became so popular that P&G sponsored other serial radio programs, which became known as soap operas. The first TV commercial for Ivory soap was in 1939.

In 1934 P&G produced Drene, their first detergent based shampoo. In 1946 P&G introduced Tide, the best laundry detergent available. They also developed toothpastes and household cleaning products. By 1948 they started an overseas division to take care of their expansion into Europe, Mexico and the Philippines.

The first fluoride toothpaste, Crest was introduced in 1955, and that year they started "divisionalization", a way of organizing their brand lines. Their brand lines developed into baby care, fabric care, family care (paper products), feminine care, hair care, grooming (shaving), drugs, oral care and skin care.

Over the years they developed many different brands. P&G had become a brand management company.

In 1960 they introduced Downey, the first fabric softener. The next year P&G was one of the first to market disposable diapers called Pampers, which eventually replaced cloth diapers. In 1963 they started a snacks division by buying Folgers coffee and five years later, Pringles potato chips.

In 1978 they added a pharmaceutical division with Didronel, the first bisphosphonate, with an indication for Paget's disease of the bone. Subsequently bisphosphonates became a huge market for osteoporosis. Over half of all women over age 50 will eventually develop osteoporosis. P&G later introduced Actonel, another bisphosphonate for osteoporosis.

In 1985 they acquired Richardson-Vicks who produced the Vicks line of over the counter cough and cold medicines as well as Oil of Olay. In 2003 they added Prilosec, a powerful stomach acid suppressant to treat ulcers and heartburn, which is now over the counter. By 1980 P&G surpassed \$10 billion in sales.

In the 1990s P&G acquired Old Spice and Max Factor. Also in the 1990s they bought Tambrands, the maker of Tampax. Additionally, they introduced Fabreze (an air freshener) and the Swiffer product line.

In the 1990s they also developed a clever fat called Olestra, which gave the mouth feel of fat but was not absorbed through the human intestine. At the time this had a lot of promise in decreasing the caloric density of snack foods like chips, crackers and cookies. However, it did not live up to its expectations. Absorbed fats are now seen as the main satiety producing food. These prevent excessive consumption of simple sugars and carbohydrates, which are increasingly blamed for the obesity epidemic. This is why low carbohydrate diets work better than low fat diets.

In 2005 P&G merged with Gillette Company, who produced hand razors, Braun electric razors, Oral B dental products and Duracell batteries. Market capitalization reached \$200 billion.

In 2014 P&G were managing around 165 brands. They calculated 65 of those made up 95% of their income, so decided to sell off the other 100. One problem for brand management companies is preventing competition between similar brands. P&G once had a food line which included Pringles, Folgers, Olestra, Jif

peanut butter, and Crisco. This line was sold off to Kellogg. They also had a stationary line that included Liquid Paper and Papermate, which they sold to Rubbermaid. They sold their pharmaceutical line to Warner-Chilcott in 2009.

After the decision to sell off 100 of their products, they sold 43 beauty brands to Coty for \$13 billion, citing sluggish growth of that division. They completed the sale in October 2016.

In April 2018 they bought the consumer health division of Merck, which included branded over-the-counter medicines around the world especially vitamin pills.

What started as an oil and fat based candle and soap maker in 1837 grew into a massive international brand management company. 2018 sales were \$67 billion, with \$10 billion in profits. Today P&G is the largest personal care company in the world with branches in 150 countries. Their formula is continual expansion of profitable brands. They sell off those that are not expanding or not profitable. P&G joined the DJIA 30 in 1932 and have remained there ever since. Although Apple recently broke the capitalization barrier of \$1 trillion, P&Gs capitalization close to a quarter of a trillion dollars - nothing to sneeze at!

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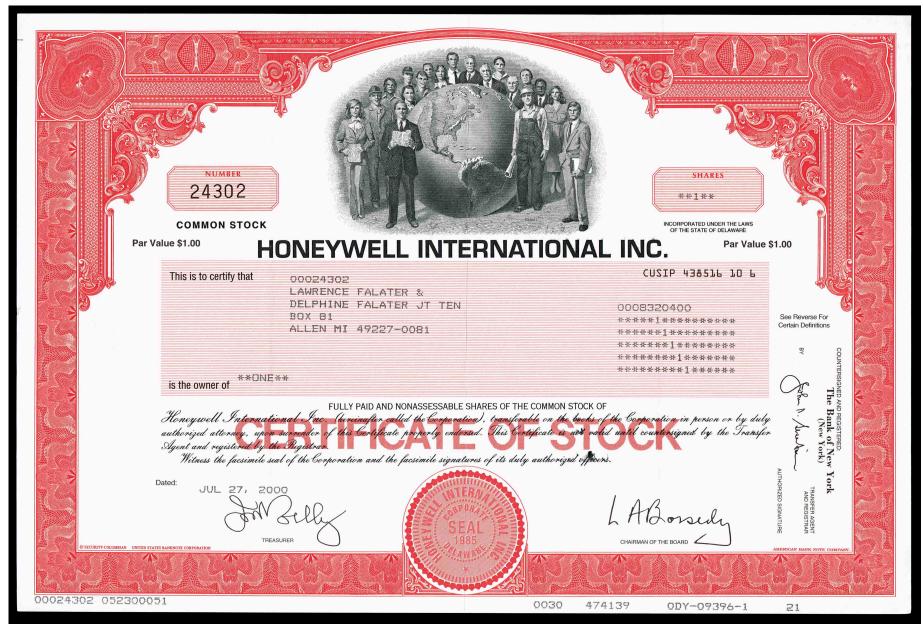
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#12. One share of common stock of Honeywell International Inc. to Larry Falater, a scripophily dealer, dated July 2000, uncancelled.
#2007



<u>Vignette of Honeywell showing large team surrounding the globe, engraved</u> by John Wallace Jr.

We have already dealt with AlliedSignal, who acquired Honeywell in 1999. Honeywell is really a continuation of AlliedSignal.

In 1885 Swiss-born Albert Butz invented the damper-flapper, a thermostat for coal furnaces. After a series of company changes Butz's 1886 Thermo-Electric Regulator Company merged in 1927 with the Honeywell heating Specialty Company in Wabash, Indiana, changing their name to Minneapolis-Honeywell Regulator Company. In 1930s they expanded into Japan, Europe and Canada. During the Great Depression the US military asked them to do engineering and manufacturing projects.

In 1941 they developed tank periscopes, camera stabilizers, and the C1 autopilot precision bomber. In 1942 they started an aero division that developed instrumentation and superchargers. In 1950 they were involved in the first nuclear submarine - the USS Nautilus. They then acquired Intervox Company for its ultrasound, sonar and telemetry and in 1953 developed auto piloting for aircraft taxiing, take-off and landing. Their most famous invention we have in our house (see opposite); it is called the T-86 thermostat, introduced in 1953.

Honeywell joint ventured with Raytheon to make computers to compete with IBM in 1955. Five years later they bought out Raytheon and established an Electronic Data Processing Division. Historically, early US computer companies were called Snow White and the Seven Dwarfs. IBM was Snow White; the dwarfs included Honeywell, NCR, RCA, and GE.

In 1965 Minneapolis-Honeywell changed their name to Honeywell. Their specialty was using electronics and other technologies to help industrial systems.

They expanded abroad and into defense and aerospace, including missile guidance systems and weaponry. Honeywell is also in the consortium that assembles US nuclear bombs. The EPA says Honeywell was the number one Superfund toxic waste site generator. It has been fined millions.



In 1999 AlliedSignal bought them out and renamed themselves Honeywell. AlliedSignal chose Honeywell as the new name for its company because of Honeywell's better name recognition; thus Honeywell was not really a new company but a continuation of itself and AlliedSignal.

In 2000 GE announced a takeover of Honeywell. But in 2001 EU's competition minister blocked the merger saying it would be monopolistic. The next year however, acquisition fever struck! Since then Honeywell bought 80 companies and made 60 divestitures!

They now have four divisions:

- Aerospace
- Home and business Technology
- Safety and Productivity Solutions
- Performance Material and Technology

Honeywell have revenues of around \$40 billion a year since 2013, with a net income averaging \$4 billion. They replaced AlliedSignal in the DJIA 30 in 2003 after their merger with Allied Signal, and left the DJIA in 2008. Allied Signal were in the DJIA 30 1985 – 2003.

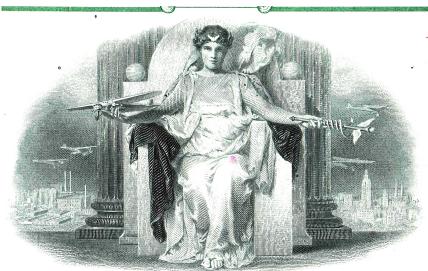
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#13. Interesting crossover certificate of United Aircraft over-stamped "NAME CHANGED TO United Technologies Corporation".

Subordinated debenture of \$1,000 at 5 3/8% interest dated August 1975 to Gunther & Co., maturing in 26 years. This was convertible to stock in the company as long as the election was taken in the first year. Company seal shows United Aircraft were registered in Delaware in 1934. Certificate printed by ABNCo. The certificate is machine punch cancelled. A debenture is an unsecured loan based only on the good name of the company; subordinated means in the case of bankruptcy, it will only be paid off after other debentures are paid off. #1971



Vignette of seated lady holding plane and caduceus. City behind with planes over.

The artwork of this vignette is by A.E. Foringer, and the engraving is by William Adolph (1866-1947). Adolph engraved for ABNCo and for the Bureau of Engraving and Printing (BEP), engraving foreign but not US bank notes. The BEP paid him \$2,500 a year in 1892 (around \$200,000 in today's terms!)

An Allegory means using a representational figure linking us to the ancient world. An Allegory is recognized by her accoutrements i.e. what she is holding or what is placed by her side. In this case she holds an airplane, a clear sign that she is the Allegory of flight. However, the other hand holds the staff of Hermes (Mercury in Rome), the messenger of the gods, guide of the dead, and protector of merchants, shepherds, gamblers, liars and thieves! I presume Foringer intended the wings on Hermes' staff to signify flight. The ancients did have the sky gods, Zeus and Hera (Jupiter and Juno in Rome), but neither held this staff. Thus the allusion to flight with Hermes' winged staff appears visual rather than correct.

United Aircraft Corporation started as United Aircraft and Transport Corporation in 1929. This was a merger of the following:

- <u>Vought Corporation</u>, founded 1929 from Lewis and Vought, which itself was formed in 1917 from a merger of Wright/Vought Company and Birdseye Lewis.
- **Boeing** founded in Seattle in 1916
- <u>Pratt and Whitney</u>, started in 1925 by Fred Rentschler when he left Wright Aeronautical to form the company
- Sikorsky Manufacturing Company, which was formed in 1925 from the Sikorsky Aero Engineering corporation, originally founded in 1923 to make helicopters

- <u>Hamilton Aero Manufacturing</u>, which started in 1920, specializing in propellers.
- <u>Standard Steel Propeller</u> (founded 1918), and Stearman Aircraft Co. United Aircraft's holding company was situated in Hartford, CT.

In 1930 Congress passed the Air Mail Act. Under the Postmaster General Walter Brown, William MacCracken, Jr. (the first US Assistant Secretary of Commerce for Aeronautics) chaired a conference with top airline executives and divided the airmail routes between them. This was later called the "spoils conference" because MacCracken gave them contracts that locked out smaller airlines. This led to a Senate investigation. The Senate cited MacCracken for Contempt of Congress in February of 1934. Attorney MacCracken had helped draft the Air Mail Act, and represented many of the major airlines. Ultimately courts imprisoned MacCracken.



MacCracken in 1934.

United Aircraft and Transport Corporation took the northern routes. Transcontinental Air Transport (which became Transcontinental and Western Air) took the mid-western routes. Western Air Express (which became American airlines) took southern routes. Later in February 1934 FDR cancelled all existing airmail contracts and gave them to the Army Air Corps until they could resolve the problem. The Air Corps was ill equipped to handle airmail in severe winter weather. Thirteen Air Corps airmen died from crashes leading to criticism of FDR. The New Postmaster General then re-awarded contracts to the airlines in the same anti-competitive way as had been done in 1930!



Keystone B-6 twin-engine airmail plane in snowstorm 1934.

The new 1934 anti-trust laws forbade aerospace manufacturing companies from owning any interest in any airlines. United Aircraft and Transport Corporation had to break up into <u>United Airlines</u>, <u>United Aircraft</u> (<u>UA</u>) east of the Mississippi, and <u>Boeing</u> in the west. UA was composed of four divisions, all under Fred Rentschler as the first President:

- Pratt and Whitney
- Chance Vought (mainly military aircraft)
- Sikorsky helicopter
- <u>Hamilton Propeller</u>

In 1939 UA joined the DJIA, where they have remained to this day (though they changed their name in 1975 to United Technologies corporation).



Fred Rentschler in 1929, the first President of United Aircraft.

UA was the sixth among US corporations for Second World War (1939-1945) production. At the end of the war the field of jet engines and helicopters engines was expanding. Rolls Royce and General Electric were strong competitors for jet engine production. Pratt and Whitney built jet engines for the Boeing 747. In the 1970s airframe builders like Boeing sold airplanes with multiple different engines, so the engine business became very competitive.

In 1974 Harry Gray became CEO and changed the name of UA to United Technologies Corporation (UTC). Being old-school management trained he then caught a bad case of acquisition fever. UTC acquired Otis Elevator, Carrier Refrigeration, and Mostek (an integrated circuit manufacturer). High-tech of any sort became the focus rather than aircraft. UTC then sold Mostek and bought Sundstrand, a supplier of aircraft parts. Later UTC acquired Chubb Security, Schweizer Aircraft, Kidde home safety products, Rocketdyne, NORESCO (an energy service company), and Clipper Windpower (wind turbines).

In 2011 UTC paid \$18.4 billion for Goodrich Corporation's aircraft component division, which it merged with Hamilton Sundstrand to form UTC Aerospace Systems. The next year the federal government fined UTC \$75 million for exporting military technology to China and "making false statements".

In 2013 UTC sold off UTC Power to Clear Edge Power. Two years later UTC Building and Industrial Systems acquired CIAT Group, a French HVAC manufacturer. The same year Lockheed Martin acquired Sikorsky Aircraft for \$9 billion. UTC returned partly to being an aerospace company with four divisions:

- Otis elevators, escalators and moving walkways
- Carrier refrigeration
- Pratt and Whitney aircraft engines
- Collins Aerospace making systems and components for aircraft.

Revenue for 12 months ending September 2019 was \$76 billion, and net income \$5 billion. Market capitalization in 2020 is \$132 billion.

United aircraft was in the DJIA 1939 to 1975, and UTC from 1975 to the present. In November 2018 UTC acquired Rockwell Collins for \$30 billion and said they intended to separate into three companies:

- UTC including Collins Aerospace (formed from Rockwell Collins and Collins Aerospace division), and Pratt and Whitney
- Otis Elevator
- Carrier Refrigeration

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By Smithsonian Institution from United States - Photograph of de Havilland twin-engine airmail plane in snow stormUploaded by PDTillman, No restrictions,

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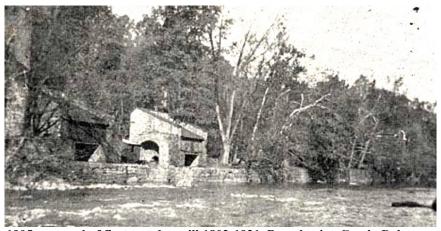
Los Angeles TimesPublication date:September 25, 1929Source:Los Angeles Times photographic archive, UCLA LibraryTransferred from en.wikipedia to Commons by Mo7amedsalim using CommonsHelper., Public Domain, https://commons.wikimedia.org/w/index.php?curid=15278389 https://en.wikipedia.org/wiki/United Technologies https://en.wikipedia.org/wiki/United Aircraft



#14. E.I. du Pont de Nemours & Company Specimen Stock Certificate for 100 preferred shares. Unissued. Hole-punch cancelled with SPECIMEN over stamps and serial number of 00000. Undated, but the previous President's signature (Crawford H. Greenwalt, President 1948-1962) has been silvered over with the signature of Lammot du Pont Copeland Sr., who was Du Pont's 11<sup>th</sup> president and CEO from 1962-1967. DuPont was incorporated in Delaware; there is no corporate seal but the registered trademark for Du Pont. #1974.



Vignette of Eleuthere du Pont's first powder mill on Brandywine Creek.



1905 postcard of first powder mill 1802-1921, Brandywine Creek, Delaware

Éleuthère Irénée du Pont (1771-1834) was the son of a Frenchman who was elevated to the nobility and allowed to put "de Nemours" after his name. The name Éleuthère is derived from the Ancient Greek name Eleutherios, meaning, "free" or "the liberator".



Antoine Lavoisier, famous French chemist left, Eleuthere du Pont right ~1790.

Antoine Lavoisier, the French father of modern chemistry, accepted Éleuthère at the age of 16 as a student at the "Régie des Poudres" – the government gunpowder manufacturer. Aged 20, two years after the French Revolution Éleuthère left the gunpowder manufacturer to help his father publish a prorepublican newspaper. Both he and his father were pro-Revolution, but in 1792 they helped Lois XVI and Marie Antoinette escape and later refused to participate in their execution. Éleuthère and his father were both jailed at times because of this, and decided to immigrate to America. They reached Rhode Island on New Year's Day 1800. Lavoisier however, suffered the guillotine.

They settled at Bergen Point, NJ. One day, during a hunt with a Major Louis de Tousard, Éleuthère du Pont's gun misfired because American gunpowder was poor quality. He asked de Tousard for a tour of an American gunpowder plant. Being an expert, he spotted the problems and decided to start a powder mill of his own at Brandywine Creek, seen in the stock certificate vignette. He named it after himself (Eleutherian Mills).

Éleuthère returned to France to interest investors, and raise money. He issued eighteen shares at \$2,000 each, naming the company (a partnership) E.I. du Pont de Nemours Company – rather a mouthful! It took a couple of years to build the mill. The first gunpowder was produced in 1804. Production continued till Éleuthère died 30 years later, either from cholera or from a heart attack. By 1850 his company was supplying more gunpowder to the US Army than anyone else. Éleuthère's sons, Alfred (1798-1856), and Henry (1812-1889), then his grandson, Eugene (1840-1902), took over as President of the Company.

The US Gunpowder Trade Association, aka the "Powder Trust" made, Lammot du Pont (1831-1884), another relative, their first president in 1872. They followed Rockefeller's Standard Oil techniques quite closely, putting competitors out of business by dropping prices then buying them up. Eugene du Pont, Éleuthère's grandson and fourth President for example, put the Chattanooga Powder Company out of business by instructing others in the Powder Trust to drop prices, then buying it up. The trust colluded amongst its members to drive others out of business.

Dynamite was first made on the Pacific coast in 1869, a strong competitor of blasting powder. By around 1880 Eugene du Pont, the du Pont president, and members of the Trust wanted to control dynamite too.

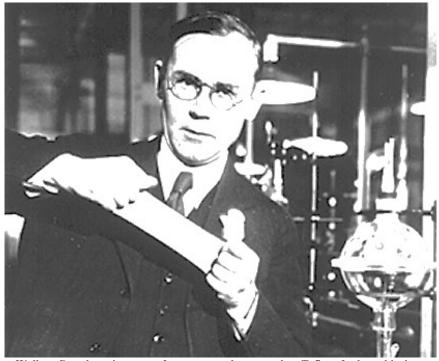
In 1899 Eugene switched from a partnership to a corporation. In 1902 Eugene died and the company was sold to Éleuthère's three great-grandsons, Thomas, Pierre and Alfred, who reincorporated du Pont. This new company incorporated in Delaware with capital of \$20 million. It paid off the three great-grandsons \$2,980,000 each for the old corporation (really a partnership).

The new 1902 corporation bought controlling stock in all the other powder and dynamite companies in the trust except ten. Within a year it bought another five, and others soon followed. By 1907 du Pont no longer needed to cut prices to drive out competition. They printed a schedule of their prices, confident that no one could compete. Between 1902 and 1907, 64 of du Pont's competing or subsidiary corporations went out of business. A court in 1907 deemed du Pont monopolistic and ordered them to divest. Lawyers wrangled among themselves for several years, but eventually Du Pont did divest.

Du Pont until now had just been in the explosives business. But in 1902 they wisely organized a centralized research department. Du Pont developed nitrocellulose for lacquers and other non-explosive chemicals. In 1915 they made nitrocellulose plastics and started pigments and paints.

Masterly Pierre du Pont, President from 1915 to 1919, also saw the future of the newly formed General Motors, and started investing in them, putting up \$25 million. In 1920 he became chairman of GM, propelling them to the number one automobile company in the world. Around 1960 US courts, citing the Clayton Anti-Trust Act, forced du Pont to sell its shares in GM.

In 1928 du Pont hired the brilliant Wallace Carothers (1896-1937) to work on polymers. After his Ph.D., Carothers taught at several universities ending up at Harvard in 1926. He invented neoprene (a synthetic rubber), polyester, nylon, Teflon and an insecticide phenothiazine. Phenothiazines later revolutionized medicine. A derivative of phenothiazine, chlorpromazine, was the first successful treatment of schizophrenia in 1950. Until then, patients with schizophrenia (almost 1% of the population) were largely institutionalized. After chlorpromazine, as long as they took their medicine, they could often be managed at home. In 1936 Carothers was elected to the National Academy of Sciences, the very first industrial organic chemist to be awarded this honor.



Wallace Carothers, inventor of neoprene, polyester, nylon, Teflon, & phenothiazines.

Tragically, Carothers suffered from another mental illness, depression. Like so many others with depression, he thought his accomplishments were meaningless and that he had run out of ideas. Aged 41, he committed suicide by drinking potassium cyanide. One wonders how many more revolutions he might have started beyond polymer chemistry and psychopharmacology, had he not suffered from depression.

From 1801 to 1940, every du Pont President was a family descendant with the du Pont name. During the Second World War (1939-1945) du Pont participated in the Manhattan Project, designing and building the Hanford, Washington plutonium plant. In the 1950s du Pont developed Mylar, Dacron, Orlon, Lycra (Spandex), Tyvek, Nomex, Corian and later Kevlar.

In 1981 du Pont acquired Conoco (Continental Oil Company) in what was then the largest merger in corporate history. This secured du Pont's petroleum based plastics production. Eighteen years later they sold Conoco to Phillip Petroleum Company. Du Pont had come a long way from just explosives. They now made biotechnology products, chemicals, synthetic fibers, lubricants, pharmaceuticals, building materials, cosmetics, paints and agricultural chemicals. In 2001 they sold their pharmaceutical business to BristolMyersSquibb for \$8 billion. Then the slice and dice era began – buying and selling various companies and spinning off others over the next decade or so.

In 2017 du Pont merged with Dow Chemicals to form DowDuPont. Net income in 2017 was \$4 billion on sales of \$62 billion. In 2018 capitalization was \$136 billion. Du Pont joined the DJIA 30 in 1935, remaining there except for their name change to DowDuPont in 2015. In 2019 Dow DuPont split into Dow, DuPont de Nemours, and Corteva. Dow is still in the DJIA, but not DuPont.

As with countless chemical companies, du Pont has produced its share of pollution. In 2004 the EPA fined du Pont \$16.5 million for perfluorooctanoic acid ("C8") contamination of drinking water, a cause of cancer. UMass Amherst labelled du Pont number four in corporate world pollution. Du Pont was also the largest business in OSHA's severe violator program in 2015.

On the other hand, Kevlar has saved the lives of many service people. Du Pont's pioneering in plastics has revolutionized society. Their genetic engineering of seeds and plants, though shunned in Europe as "not natural", has reduced starvation across the world. It has also made soybean oil healthier; increased the efficiency of photosynthesis; increased plant resistance to salinity, drought and viruses; reduced plants' need for nitrogen fertilizers; and reduced their need for herbicides and pesticides. Du Pont has also led the pack in phasing out CFC (chlorofluorocarbon) production, and finding a replacement for these refrigerants and aerosol propellants. CFCs once caused a hole in the ozone layer (which reduces ultraviolet radiation). In 2018 the hole reappeared caused by illicit Chinese uses of CFCs.



Winterthur Museum in Delaware.

One of the du Ponts, Henry Francis du Pont (1890-1969), a renowned horticulturist and antiques collector built a house, Winterthur, on 2,500 acres in Delaware in 1932. It is now the fifth largest private US residence in history, and a museum, near Brandywine Creek where the Eleutherian Mills started.

Another du Pont, Willis, hit the news in 1967. Nervous about kidnapping, Willis had built ten-foot walls surrounding his 42-room Florida mansion and extending 100 feet out into the sea. He had replaced security guards with a state-of-the-art electronic system, complete with closed-circuit TV cameras. But, one night he forgot to turn his security system on. At midnight, five hooded and gloved gunmen broke into his estate at Coconut Grove, Florida. The burglars tied up the du Ponts with silk neckties. They chided Willis for not having to work for a living. When the maid said she felt cold, the robbers fetched her a robe. The next minute when du Pont's wife, Miren, forgot the combination to the safe, they suggested that a bullet in her brain might improve her memory. The burglars stole Willis' fabulous collection of 7,000 rare coins, as well as jewelry and cash.

They dumped the loot into the du Pont's expensive luggage and escaped in Miren's red Cadillac convertible. The burglars said they would ransom the collection back to du Pont. But they never did. The heist was valued at \$1.5 million at the time, today over \$10 million.

The du Ponts hired Harold Gray, an attorney, to hunt down the treasure. The next year Gray agreed to pay for "those missing coins" through a Miami bail bondsman. An FBI sting operation was set up, and two men were nabbed with 13 territorial gold pieces. Shortly after, a Miami hood named William Metzler punched his wife. Her father chased him and beat him senseless. When Metzler arrived in the Emergency Room, staff found a gold coin taped to his ankle. It was a Brasher Doubloon, today worth several million dollars. He said he stole the coin from the original robbers. He was jailed for five years.

Gray returned to his law practice, but every coin dealer knew to contact him with anything suspicious. In 1981 Gray was told of a man who had an 1804 dollar for sale (today also worth multiple millions of dollars). He turned out to be a mob runner, and was nabbed in another FBI sting. Subsequently another 1804 dollar turned up and other priceless coins.

Since then developers tore down the 27,000 square foot 1964 mansion on five acres, and built seven new luxury homes.

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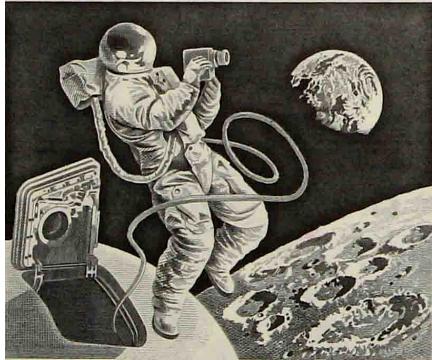
Museum - DSC01316.JPG

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#17. Eastman Kodak convertible subordinated debenture of \$1,000 at 81/4%, issued to NAP & Company, dated February 1984, and due 2007. This was a bond, unsecured by company property, which was convertible to stock. The certificate is uncancelled, and was printed by ABNCo. Note the CUSIP number (top right). This was an acronym for Committee on Uniform Security Identification Procedures, starting in 1967. The number was used to identify securities to facilitate market transactions. #1956

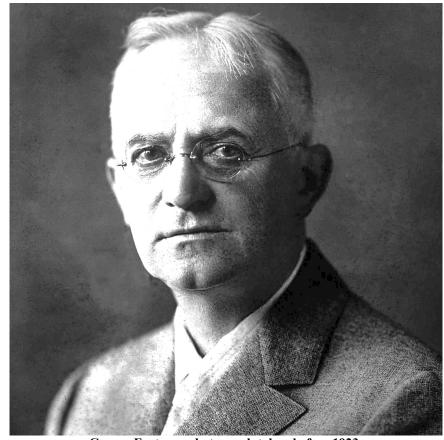




Vignettes from Kodak bond.

George Eastman (1854-1932) founded the Eastman Kodak Company, bringing photography to the masses. When he was eight his father died, so his mother took in boarders to pay for George's private schooling. But by the age of 14 George had to leave school to help support his mother. He started as a messenger boy with an insurance firm at \$3 a week. A year later his sister died from polio. He got another job as an office boy for a different insurance company at \$5 a week.

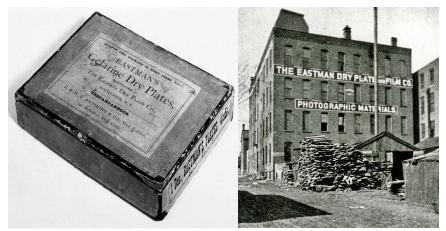
But money was too tight. He decided to study accounting to get paid more. How many fifteen year-olds do you know today who have that drive? Four years later he got a job as a junior clerk at the Rochester Savings Bank at \$15 a week.



George Eastman photograph taken before 1923.

When he was 24, he decided on a vacation to Santo Domingo. A friend suggested that he take a camera with him. He ended up never taking the vacation but bought the camera, describing the outfit as a "pack-horse load". He became engrossed in photography, but realized the equipment was far too bulky, so resolved to make it more practicable. At the time photographers had to prepare fresh wet glass plates with egg white (albumen) and expose them before the emulsion dried out. George had read in British magazines that photographers there were experimenting with gelatin emulsions. Gelatin comes from collagen, found in the bones, skin, and connective tissue of animals.

In the evenings after work, Eastman experimented in his mother's kitchen. After three years he patented a gelatin emulsion and dry plate coating machine in both England and US. That same year in 1881 he formed the Eastman Dry Plate and Film Company selling dry glass plates to other photographers.



Left: Box of 12 glass dry plate films early 1880s Right: Dry plate Factory 1884.

The same year Henry Strong, a local Rochester businessman, invested money in Eastman's business and they formed a partnership called Eastman Dry Plate Company. At this point Eastman resigned his bank job to manage his dry plate business. Strong was later President 1884-1919. In 1883 Eastman started supplying his dry film on rolls of paper that would fit standard cameras, replacing glass plates. But the grain of the paper showed through in the photos so he developed a process where he put soluble gelatin on the paper first, then another layer of insoluble light sensitive gelatin.

After exposure the paper was removed and another layer of soluble gelatin was added and the whole encased in a collodion varnish. This created a flexible plastic negative. A little detail now follows about collodion, and about celluloid that became so important for the production of still and movie film.

Cellulose is the main component of green plants. Cotton fibers are 90% cellulose, and wood is 40-50% cellulose. Some types of plankton are almost 100% cellulose. Chemically, cellulose is composed of long chains of glucose. Plants make glucose from carbon dioxide, water, and sunlight in a process called photosynthesis. Ruminant animals can digest cellulose into glucose – with the help of gut bacteria, but humans cannot digest it, so it acts as dietary fiber.

In 1832 a Frenchman, Henri Bracannot, discovered that if nitric acid was combined with wood fibers it would produce nitrocellulose (also called flash paper and guncotton). In 1846 the Frenchman, Louis-Nicolas Ménard, discovered that if nitrocellulose was dissolved in alcohol and ether, it would dry out as a plastic film called collodion. The next year collodion was first used as a flexible wound dressing. In 1848 people started using it on photographic plates. The American, John Hyatt, in 1868 combined nitrocellulose with camphor to produce the first plastic called celluloid.

The photographic process went through a number of iterations using different chemicals and techniques:

- Daguerreotype 1839-1860. Silver plated copper was made light sensitive with iodine vapor. It is a direct positive image but looks as it would in a mirror.
- Salted Paper Prints and Talbotypes 1840-1860
- Albumen Prints 1850-1895 egg white (albumen) coating on paper or glass, containing light sensitive chemicals. This was the first photographic process to use negatives. Most 1800s photos were albumen. Collodion could be used as an alternative to albumen.
- Tintypes 1856-1930 same as daguerreotypes only they used tin or iron not copper. This was cheaper than the albumen process.
- Platinum and palladium prints 1873-1920, used platinum and palladium salts instead of silver salts. Art photographers favored it.
- Photogravure 1880 to present a photomechanical printing process.
- Gelatin silver prints (paper) 1890 to present. Silver halides are suspended in a gelatin binder on paper. Such papers were always a manufactured product because of the chemical and production complexity. The same emulsion is used on the original film as well as on printed paper. The paper was often made with barium sulfate coating, which gave it more detail, definition, and tonal range.

In 1884 Eastman changed his company's name to Eastman Dry Plate and Film Company with 14 stockholders. In 1888 Eastman took the process one step further. He made the first Kodak camera. It took round pictures measuring 2.5" and had fixed focus. It was a box camera preloaded with paper-based film for 100 photos selling for \$25. After exposures the camera was mailed to Rochester, NY, where the film was developed; prints were made and a new film was loaded into the camera, all for \$10. Eastman used the "razor and blades strategy", i.e. no profit on the razor, big profits on the blades (no profit on the camera, big profit on the film). In 1892 he changed the name again to Eastman Kodak Company of New York.



Original Kodak camera 1888 "you press the button; we do the rest"

Eastman invented the slogan "you press the button; we do the rest". He also invented the word Kodak, which he registered as a trademark the same year. He soon switched from paper-based film to celluloid based film. His four business principles were:

- Focus on the customer
- Mass production to decrease costs
- World-wide distribution
- Extensive advertising.

He advertised a fashionably dressed attractive young lady holding a Kodak camera. Her outfit changed each year.



The fashionable Kodak lady – advertisements 1900-1910 era.

Eastman plowed back all profits into the business. He was also far ahead of his time in personnel development. In 1899 he gifted employees a substantial year-end gift. Later he paid employees a "wage dividend". This was calculated from the employees' wages and the year-end stock dividend. In 1919 he gave away one third of his own stock to employees. He felt that success and its resultant riches depended on workers' goodwill and loyalty.

After his first 1888 Kodak camera, Eastman brought out a second range of cameras called "Ordinary range", and soon after developed a folding compact Kodak camera with bellows. In 1895 Kodak produced his first Pocket Kodak for \$5, which produced 1.5" x 2" negatives. In 1900 Kodak produced the Brownie camera, which he marketed to children as well as adults. What brilliant marketing! In 1935 Kodachrome started, a color reversal stock for movie and slide film. In 1930 Kodak joined the DJIA 30 where it remained until 2004.



Brownie 2 (1901-1935) low priced Kodak camera.

George Eastman never married. His mother died when he was 53, after which he drew closer to Josephine Dickman, a trained singer. She was the wife of George Dickman, second in command at Kodak. Eastman built a mansion in Rochester. He lived his philosophy: what we do at work determines what we have; what we do in our leisure determines what we are. This was a variant on the "work hard and play hard" philosophy. Eastman visited Europe yearly to travel art galleries. He loved to give dinner parties, play the piano and have musical evenings. Rochester boomed from Eastman's business.

Philanthropy loomed large in Eastman's psyche. Many of the assistants he hired came from the Massachusetts Institute of Technology (MIT), which he admired. He shunned personal publicity. Few people in Rochester even knew what he looked like! He donated \$30 million to MIT under the pseudonym "Mr. Smith". It was some years before MIT found out who the real donor was! Eastman also favored black education, giving to Tuskegee Institute, Alabama and Hampton Institute, VA. Another of his passions was dentistry, especially for children. He gave to the school of Dentistry and Medicine in Rochester. He explained that

black education and dental treatment gave the best "bang for the buck" (somewhat reminiscent of Bill and Melinda Gates' vaccination and low cost toilet programs). His estate was bequeathed to Rochester University. His love of music also endowed the now famous Eastman School of Music in Rochester.

From 1930 – 1932 Eastman suffered with progressive back pain, perhaps spinal stenosis or cancer, which led to depression. In 1932 at the age of 78, he shot himself through his heart. He wrote a suicide note that read "my work is done; why wait?" Some have suggested he feared yet more discomforts of old age.



Kodak Instamatic 100 1963 for \$16

**Kodak Pocket Instamatic 100 1972** 

In 1963 Kodak produced the Instamatic, the first point and shoot camera. I remember getting one, as well as the pocket instamatic above, with its flashcube.

In 1975 Kodak scientists invented the first digital camera, and in 1986 made the first megapixel sensor (over one million pixels) for a digital camera. Five years later they produced the first digital SLR (single lens reflex) camera from an adapted Nikon F3. Unfortunately, Kodak joined the digital revolution too late. Although they had invented the digital camera, they dropped it, fearing it would cut into their profitable photo business. In 1990s Kodak again talked about going digital, but Kodak's executives could not imagine a world without film, and again put off digitalization.

Customers gradually switched to digital cameras. Other Asian companies stepped in to fill the void. Kodak discovered with extensive market research that women loved taking photos but were frustrated by trying to move them to their PCs. So, in 2003 they made the Kodak Easy Share Digital Camera, which attached directly to a printer to print photos without even using a computer. Indeed, I recall buying one at the time!

In 2003 Kodak invented PACS, which as a physician I have also used. PACS is a software program, an acronym for Picture Archiving and Communication Systems. It was used for digital X-ray management. When X-Rays went digital, instead of going to the X-Ray reading room and asking for the X-Rays, you went into a small dark room, entered your passwords and details on a regular computer screen, and the digital X-Ray popped up on a very high resolution black and white screen. You could vary contrast and brightness, and sometimes see things you could not see on a normal X-Ray film.

In the late 2000s smart phones took more and more digital photos. The iPhone started in 2007. Kodak had missed the boat. They decided to outsource their film and manufacturing, and move to printers.

With printers, Kodak reversed the normal "razor and blades strategy" of Hewlett-Packard and Asian manufacturers. Instead of low profit printers and high profit ink they went with high profit printers and low profit ink. By 2011 their core business was the printer. But the next year they filed for bankruptcy and in 2013 reorganized with five divisions:

- Print Systems
- Enterprise Inkjet Systems
- Micro 3D Printing and Packaging
- Software and Solutions
- Consumer and Film

Kodak now provides printing, graphic communication and professional services for commercial enterprises like printing companies. They no longer cater to the general public. A shadow of their former self, they illustrate well the life cycle of a company. Kodak's revenues sunk from a peak of \$16 billion in the late 1980s to around \$1.5 billion in 2018. In the late 1980s Kodak had 145,000 worldwide employees; it now has 23,000. In the late 1980s capitalization was \$30 billion, it is now worth only \$160 million. Eastman Kodak was in the DJIA from 1930 to 2003.

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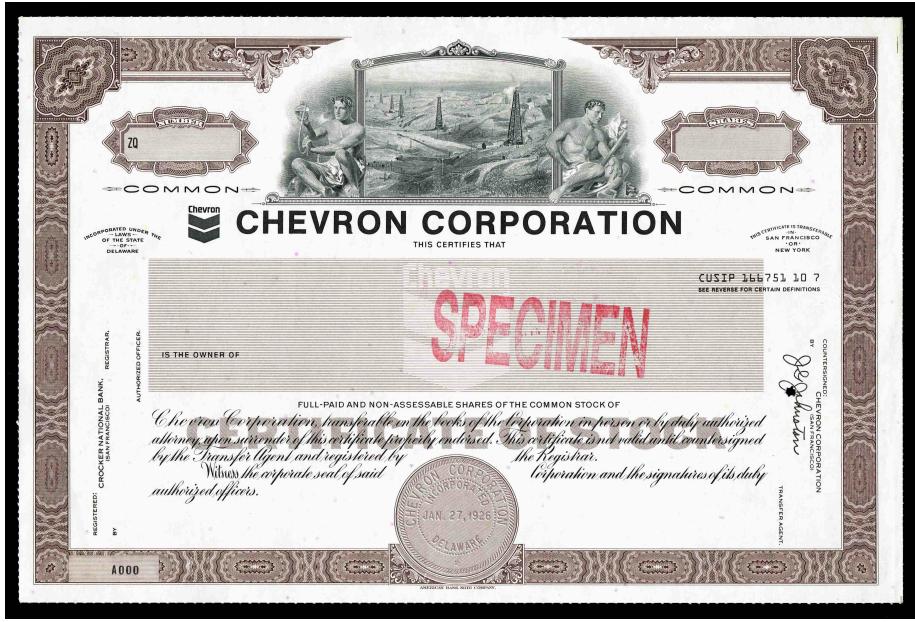
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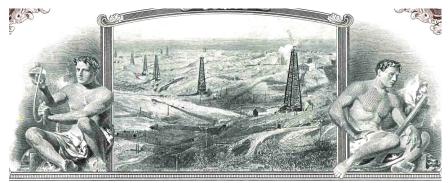
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#18. Chevron Corporation Specimen Common Stock Certificate unissued and hole punch and stamp cancelled with SPECIMEN.

The company was incorporated in Delaware in 1926. ABNCo printed the certificate. There are no officer's signatures, and the serial number is left blank except for ZQ. #2056



Male Allegory of chemistry left & mining right, flanking oil field with derricks.

Although Chevron is a giant company in its own right it was really a spin off from Standard Oil after the 1911 trust busting. Here are the fates of largest five:

Std Oil of NJ (Jersey Standard) → Eastern States Std Oil (ESSO) → Exxon **Std Oil of NY** (SOCONY) → Mobil, later merged with Exxon → ExxonMobil Std Oil Co (SOHIO) → became subsidiary of British Petroleum (BP) Std Oil of Indiana → American Oil Co (AMOCO) Std Oil of Calif (SOCAL) → ChevronTexaco → Chevron

From 1940s to 1970s the "seven sisters" (alluding to the mythological Pleiades sisters fathered by the titan Atlas) were the companies that controlled 85% of the world's petroleum reserves. After the 1973 oil crisis, OPEC and the big state run oil companies became dominant. The fate of the seven sisters was:

Anglo-Iranian Oil Company	→BP
Gulf Oil}	
Standard Oil Company of California (SOCAL)	→Chevron
Texaco}	
Royal Dutch Shell	→Royal Dutch
Std Oil Company of New Jersey-→ESSO→ EXXON}	•
Std Oil Company of New York (SOCONY) → Mobil}	→EXXONMobil

The largest oil companies in the world in 2018 are listed below:

	2017	Capitalization	ı Net	
	Revenue	2018	<b>Profits</b>	
Company	\$ Billions	\$ Billions	\$ Billions	<b>Employees</b>
Sinopec (China)	426	State run		250,000
Royal Dutch Shell (UK&Netherlan	nd) 388	243	13	92,000
Saudi Aramco (Saudi Arabia)	356	State run		65,000
China National Petroleum Corp	346	State run		1,600,000
BP (UK)	299	129	3	74,000
ExxonMobil (US)	290	327	19	70,000
Kuwait Petroleum Corp (2017)	252	State run		96,000
Total SA (France)	209	145	11	98,000
Chevron (US)	159	216	9	52,000
Eni (Italy) (2017)	132	114	4	81,000

What does this list tell you? It tells you that the largest oil companies in the world tend to be state run, and they tend to have more employees per unit of income. Also, for the private companies, capitalization is not that much more than their revenue, and profits tend to be around 5% of sales.

In 1933 Saudi King Ibn Saud, negotiated a deal with Standard Oil Company of California (SOCAL), a precursor of Chevron, to pay for oil produced, using English sovereigns. SOCAL discovered the Ghawar Field in 1948, the world's largest oilfield. The California-Arabia Standard Oil Company changed its name to the Arabian American Oil Company (ARAMCO) in 1944. It was illegal for the US government to sell gold to private companies at the time. They could only sell it to foreign governments (here Saudi Arabia). Consequently, the US Mint made 91,210 four-sovereign sized pieces in 1945, and 121,364 onesovereign sized pieces in 1947, as the US could not locate enough gold sovereigns on the market; England and its colonies had stopped making them.



Abd Al-Aziz bin Saud gold sovereign. Courtesy of Heritage Auctions, HA.com.

Between 1973 and 1980 the Saudi government bought out ARAMCO. In 1984 SOCAL merged with Gulf Oil, the largest merger at the time, and changed their name to Chevron Corporation. In 2000 Chevron also bought out Texaco for \$45 billion. Chevron has oil fields and refineries all over the world. They have also invested in geothermal, solar, wind, batteries, and biofuels, but seem to see the future of petrochemicals as being brighter.

The average pump profit per gallon of gas is around 15-20 cents, but after credit card fees, and other operating costs, the net profit is more like 3-5 cents. Most of their money is made from running their attached convenience stores. Only 2% of convenience stores are run by major oil companies.

Chevron sells under the names Chevron, Texaco and Caltex. It also sells motor, aviation and marine fuels, lubricants, petrochemicals to make plastics, and liquefied natural gas. Chevron was in the DJIA as SOCAL from 1930; in 1984 they changed their name to Chevron and remained in the DJIA until 1999.

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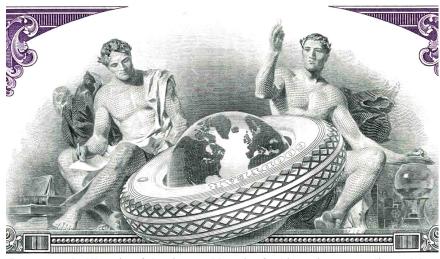


#20. Goodyear Tire and Rubber Company Sinking Fund Debenture for \$5,000 for 25 years from 1970 to 1995 at 8.6%.

A debenture is a bond not backed by any assets, just faith in the company. They say they created a sinking fund to pay off the bond, but likely it was just to make the investor feel more comfortable; they could easily have stopped funding it or dipped into it.

This is a specimen certificate, unissued, and hole punch and stamp cancelled with SPECIMEN. The seal says Akron, Ohio, without a date or the word incorporated, though that is the presumption. Printed by ABNCo.

#1990



Laureate male Allegories of chemistry and learning flanking a tire surrounding a globe.

Charles Goodyear (1800-1860) worked tirelessly to try to make rubber a more useful substance. From 1831, he worked with natural gum elastic, adding various chemicals to remove the stickiness and make it heat and acid resistant. One day he had mixed gum elastic with sulfur, and accidentally spilt it onto a hot stove. The tough resulting rubber was just what he was looking for. It was called vulcanized rubber. He got his patent for vulcanization in 1844.

He died almost penniless and quite tragically. He travelled to New York to see his dying daughter. When he got there, he was told she had already died. He then collapsed on the spot and died. He was only 59.



**Charles Goodyear 1800-1860** 

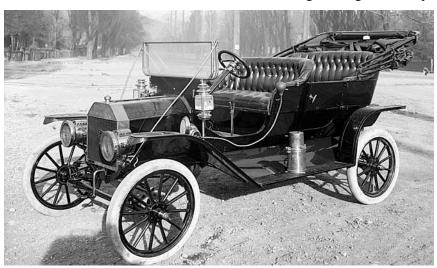


Frank Seiberling 1859-1955

Frank Seiberling (1859-1955) worked in his father's manufacturing company that made one of the first reaping machines. In 1898 Frank, with his brother Charles, started a rubber company they called the Goodyear Tire and Rubber Company in Akron, Ohio. They had 13 employees, and manufactured bicycle and carriage tires, rubber horseshoe pads and poker chips. They named it after Charles Goodyear the inventor of vulcanization. Frank was Secretary and General Manager. They called him the "little Napoleon" of rubber because of his small stature and his refusal to give up on anything. Two years later, Frank decided on the Wingfoot as the trademark. This is the winged foot of Hermes (Greek) or Mercury (Roman) – the God of commerce, merchants, travel, luck, the herald of good news, and thieves!



In 1901 Goodyear supplied Henry Ford with racing tires, and six years later they sold 1,200 sets of tires to Ford for the Model T. Thus began a long relationship.



1910 Ford Model T fitted with Goodyear tires.

In 1903 Paul Litchfield, who worked in the company, received a patent for tubeless auto tires. In 1908 Seiberling, who also accumulated 19 rubber related patents, invented the Seiberling tire-building machine. Goodyear opened another factory to manufacture the machines, which they sold to competitors under license for a fee, making \$2 million. The next year Goodyear produced their first aircraft tire. In 1910 they opened their first subsidiary in Ontario, Canada. In 1912 Goodyear manufactured the envelope to their first blimp to advertise their company. In 1915 Seiberling built a large Tudor Revival mansion in Akron, OH, called Stan Hywet Hall, which can be toured today.



Frank Seiberling's Stan Hywet Hall and Gardens, Tudor Revival house built 1915



Paul Litchfield, Goodyear President, testifying before Congress 1937.

In 1916 Paul Litchfield, the inventor of the tubeless auto tire, was Vice President when Goodyear bought 36,000 acres of land in Arizona for cotton to reinforce tire rubber. That year, Goodyear became the largest tire company in the world. Their slogan was "more people ride on Goodyear tires than on any other kind".

In 1919 Goodyear made the first bulletproof rubber-lined gas tanks for airplanes.

In 1921 Goodyear refinanced. Frank and Charles Seiberling left, and set up their own Seiberling Rubber Company. They cared more for their employees than Goodyear, but they did not have many of them!

In 1927 Goodyear had an IPO on the New York Stock Exchange. In 1935 they acquired their rival, Kelly-Springfield Tire. That year, workers organized to form the United Rubber Workers, a Union group to address grievances. The next year they went on strike because Goodyear lowered wages and demanded increased productivity. The strikes were sit-down strikes, which hampered usual company practices of the day e.g. sending in scabs. If there was someone already sitting down in their place of work, the scab could not replace them.

During the First World War (1914-1918), the US Navy made the DN-1, their first airship, based on a German design. Unfortunately, the design was flawed: the airship had no lift and sank on its maiden voyage! Goodyear made the envelopes of B class blimps (1917-1918), and Curtiss Aircraft built the gondolas.

The C class blimp (1918-1922) improved on the B class with a crew of four, 1,440-mile range, and speed of 40-60 mph. The D class blimp (1920-1924) had twice the useful lift and could carry four bombs and a Lewis gun.

In 1924 Paul Litchfield, now President of Goodyear, joint ventured with Zeppelin to start the Goodyear-Zeppelin Corporation to make airships, which lasted till 1940. This was another part of Goodyear that has carried through to this day, using blimps to advertise themselves. But at the time blimps were much more important. They were the equivalent of helicopters.

We are used to helicopters doing sea rescue today. But the first helicopter, made by Sikorsky, was in 1939; and helicopters did not become commonplace in the forces till 1951 during the Korean War (1950-1953). Before that, airships filled the void, so to speak! They could rescue people at sea. But much more importantly they could detect submarines. During the First World War (1914-1918) submarines would not attack a convoy accompanied by an airship for fear of being sunk by depth charges from the airship or another surface escort. Even during the Second World War no convoy was ever sunk by a submarine if escorted by an airship. When Nazi U-boats patrolled the eastern US coast, blimps were the only realistic way to spot them.

The first helium only blimp, the Pilgrim, was an AD class starting in 1925. It carried four people at speeds of 50 mph with a 525-mile range. Subsequently all US blimps were filled with helium, not hydrogen. (The Nazi hydrogen-filled Hindenburg disaster in 1937 was, likely caused by an electrostatic discharge).

The K class helium blimps (1938-1959) carried ten people at 60-80 mph over 2,200 miles. 134 of them were built. They were used for anti-submarine patrols in the Atlantic, Pacific and Mediterranean during the Second World War (1939-1945). They had radar, sonobuoys (expendable sonars dropped from the airship into the water), and magnetic anomaly detection equipment. They carried four



K class Blimps used 1938-1959 for anti-submarine, and for sea rescue.



**Last Goodyear blimp the "spirit of Innovation" 2017.** 



The new Wingfoot One (N1A) first Goodyear semi-rigid airship 2014

Mk 47 depth charges. In 1944 they were the first non-rigid airship to cross the Atlantic. Only one of them was ever shot down.

After the Second World War Goodyear used these blimps for advertising and capturing aerial views of sporting events. They did not have drones back then!

Blimps are airships without structural support. In 2014 semi-rigid blimps called Wingfoot replaced the Goodyear blimps. 246 feet long with 300,000 cubic feet of helium, they can travel at up to 70 mph and seat 14 people. There are three vectored engines at the rear to steer the airship. It can fly for 24-40 hours.

And now for the rest of the story...during the Second World War, Goodyear manufactured Corsair fighter planes. In 1940 Goodyear were forced to dissolve the Nazi Zeppelin partnership.

After the war in 1946 Michelin made the first radial tires. It took almost 20 years for Goodyear to follow suit. In 1968 Consumer Reports sealed the fate of radials saying radial tires were better. In 1973 Goodyear introduced steel belted radials, which were accepted by all US carmakers. The next year, Charles Pilliod Jr., Goodyear CEO, invested around \$800 million to retool for radials. Had he not done so Goodyear would likely not exist today. In 1977 Goodyear made the first all season tire.

In 1986 British financier, James Goldsmith, threatening a take-over, bought 12% of Goodyear stock. Goodyear bought them out, as well as buying back many other shareholder's shares. They restructured in 1991, closing some plants, laying off 12,000 employees, selling Goodyear Aerospace (nothing to do with the blimps) and other subsidiaries. In 1993 Goodyear expanded into China, and six years later allied with Sumitomo Rubber in Japan. In 2018 Goodyear and Bridgestone created TireHub, their own distribution network, and dropped out of American Tire Distributors.

Goodyear market under the brands Dunlop, Kelly, Goodyear, Fulda, Sava and Ebica. They have manufacturing centers in 22 countries in North and South America, Europe, Asia, and Australia, and sell auto, aviation, truck, off-road, racing and RV tires. Divisions include Goodyear blimp, auto service centers for oil changes, and rubber related chemicals. They were in the DJIA 1930 to 1999.

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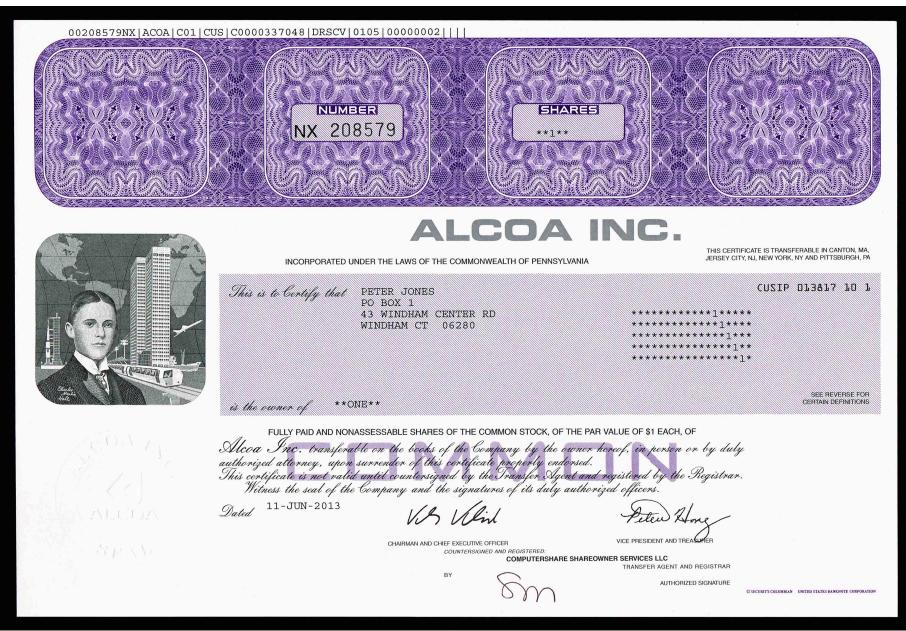
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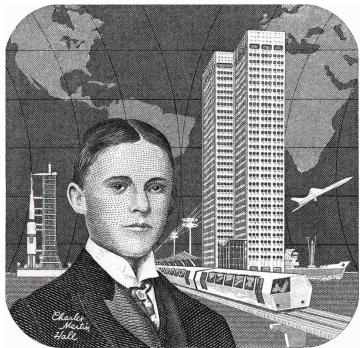
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#24. ALCOA Inc. Stock Certificate for one share of common stock to myself, dated June 2013, uncancelled. Printed by Security Columbian, US Banknote Corporation. There is no seal. The certificate says ALCOA was incorporated in Pennsylvania. #2075



Charles Hall. Uses of aluminum: building, rail, ships, power-lines, space. Photo below.



Aluminum was discovered in the early 1800's and by 1850 crude extraction methods were used. By 1852 it sold for \$34 an ounce – more expensive than gold. In the 1860's aluminum was used to strike pattern coins as well as expensive baubles for collectors.

Charles Hall (1863-1914) was a boyhood chemist. After studying chemistry at college, he and his sister, Julia, experimented on how to extract aluminum from bauxite (aluminum hydroxide with iron oxide and clay). Julia went to Oberlin College of Music and also briefly studied chemistry. At the age of 22 Charles discovered that molten cryolite (Na<sub>3</sub> Al F<sub>6</sub>) would dissolve aluminum hydroxide from bauxite, under electrolysis. Almost simultaneously in France, Paul Héroult discovered the same process. This process is now called the Hall-Héroult process. Hall's bust is shown opposite. Interestingly the photo was a mirrorimage of the engraving, so obviously the engraver used the original photograph to make the engraving.

In 1888, Romaine Cole, a businessman that Hall met in Pittsburgh, PA, introduced him to Capt. Alfred Hunt, a prominent metallurgist. Hunt called five associates to put up \$20,000 each (in \$5,000 increments) to build a pilot plant named the Pittsburgh Reduction Company (PRC). Hall was 25 at the time. Cole negotiated 47% of the common stock for the investors and the rest for Hall. There are honorable people in business!

But Hall did not get on with Cole, though he did get on with the very first person he hired, Arthur Davis (1867-1962). Davis joined the company in 1888, becoming general manager and director in 1892. He became president in 1910 and chairman of the board in 1928. He finally retired in 1958 after 70 years with the company! How's that for long service!







Julia Hall, Charles' sister 1859-1926

PRC dropped their price from \$8 a pound to 36¢ a pound from 1888 to 1897, creating a mass market. ALCOA needed lots of electricity for the electrolytic process, so they started a plant in Niagara in 1895 to use hydroelectric power from the Niagara Falls. Their modus operandi was vertical integration – raw material, power generation, core smelting business, and fabrication.

Arthur Davis started making aluminum kettles in 1895, to create a market for the new metal. Aluminum conducts heat very well. Eventually he promoted a line of cookware they called Wear-Ever. Every spring Davis hired college students to promote the cookware. The Wright brother's first engine block was made of aluminum. Autos started using aluminum engine blocks and bodies too. In 1907 the company name was changed to Aluminum Co of America (ALCOA). In 1910 they introduced aluminum foil, and four years later they introduced 2017-T4, an alloy for aerospace, which is still used.

During the First World War (1914-1918) they made mess kits, helmets, and gas masks. Aluminum was a third of the specific gravity of brass and iron. During the war 90% of output was used for the military. After the war Reynolds, of cigarette fame, founded the US Foil Co to make cigarette wrappers, and later other uses. In 1925 ALCOA went public. By 1928 it was producing 150,000 tons of aluminum a year, over half the world's aluminum. Arthur Davis saw that foreign business was conducted differently, so started a separate Aluminum Ltd of Canada in 1925, later ALCAN.

Before the Second World War Germany had developed Duralumin a very strong alloy of aluminum with copper and magnesium. The US government then pressured ALCOA to develop a research facility, which they built in 1930, resulting in new alloys. Charles Hall had obtained a patent for his process of extracting aluminum, but the Sherman Antitrust Act of 1890 had led to claims in 1912 that ALCOA was a monopoly. It was not until 1937 that ALCOA started fighting an antitrust case. However, as aluminum became a strategic material during the Second World War (1939-1945) the US government could not very well dissolve the company that controlled 90% of the US market! During the war, production rose from 150,000 to 800,000 tons a year, particularly to feed aircraft production. After the war the ALCOA monopoly was forced to sell its plants to three rivals: Aluminum Ltd (later ALCAN), Reynolds, and Kaiser.

In the 1950's three more competitors arose: Anaconda, Ormet, and Harvey. In 1958 ALCOA, previously averse to overseas expansion, expanded into Bauxite mines in Suriname, and the next year into Australia and Brazil. In 1962 they developed iron soda cans with "Easy-Open" technology for beers (aluminum tops with pull back tabs). In 1979 they started the Alcoa Recycling Company to recycle aluminum.

The cylinder of the cans became aluminum later. ALCOA also started RCS (rigid container sheets). In 1978 aluminum began trading on the London Metal Exchange. ALCOA became more computerized and customer focused under Paul O'Neill, who became chairman in 1987, and who left in 2001 to become the Secretary of the US Treasury. Additionally in 2001, ALCOA became a component of the Dow Jones Sustainability Index, where it remains today. Aluminum Company of America was part of the DJIA from 1959 to 1998, when it officially changed its name to Alcoa where it remained until 2012.



1962 ALCOA Easy-Open can top.

2004 first aluminum bottle.

In 2016 Alcoa separated into two independent companies, Alcoa and Arconic. Alcoa retained the mining/refining/smelting and power businesses, and Arconic became the fabrication part of the old Alcoa.

Alcoa's capitalization was \$3.8 billion in 2018. 2018 profits were \$227 million, on sales of \$13 billion in 15 countries. Unfortunately, Arconic sold the aluminum cladding for "Reynobond PE aluminum composite panels" to Omnis Exteriors. The aluminum was not a fire risk but the polyethylene composite was. Reynobond PE was used on the Grenfell Tower, a 120 apartment block for low-income residents in London, UK, which burnt in 2017 killing 72 people.

In October 2018, Apollo Global Management, a private equity firm, offered \$11 billion to buy Arconic. In the middle of all this President Trump announced tariffs on aluminum imports making the situation more complex. Stay posted!

Aluminum it the second most used metal in the world after steel. It is very light, very malleable (can be flattened to extremely thin sheets) and very ductile (can be drawn out into very thin long wires). It is strong (especially in alloys), and is an excellent heat and electricity conductor (one gram of aluminum conducts twice the electricity of one gram of copper, thus aluminum not copper is used in high voltage cables). It is resistant to corrosion. It is used for transportation (engines, fuselage, planes, vehicles); building (siding, roofing, gutters, window frames, ducts, two-by-fours); and packaging (foil, trays, cans, and now bottles which are more recyclable than glass bottles).

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By A. C. (Arthur Courtland) Falor (13 Mar 1855 - 26 Jan 1942), photographer, Oberlin College - Julia Brainerd Hall 1881 Oberlin College Senior Year Portrait by A. C. (Arthur Courtland) Falor (13 Mar 1855 - 26 Jan 1942), photographer, Oberlin College. Photograph from Oberlin College Archives., Public Domain, <a href="https://commons.wikimedia.org/w/index.php?curid=48557058">https://commons.wikimedia.org/w/index.php?curid=48557058</a>



#26. Johns-Manville Company Specimen 100 shares of common stock, unissued, hole punch and stamp cancelled with SPECIMEN, unsigned. Undated, but the boilerplate reads 1913 with \$5 million of common stock and \$5 million of preferred stock. Another stamp reads, "return to RECORDS & SPECIMEN DEPT." Printed by ABNCo, registered in New York, no seal. #2093



Vignette showing American eagle clutching 13-star shield,

Arrows right claw, olive branch left claw (usually the other way round).

Nobles during the Roman Empire used to impress dinner guests by throwing asbestos napkins into the fireplace, then removing the whole napkin, still white despite the fire. Roman historians commented that slaves who had woven the asbestos napkins coughed a lot and died young. Asbestos has been mined since Roman times. It is made of straight and curly fibers. The curly fibers can be woven to make material that is fire resistant and an electrical insulator. Yes – you guessed it! Johns Manville was an asbestos company.

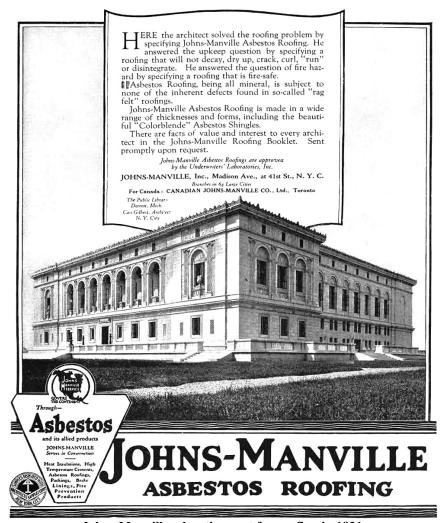
Henry Ward Johns (?1837 ?1858-1898) founded the Johns Manufacturing Company in New York City in 1879 to make fire resistant asbestos roofing, textiles and insulation. He died of "dust phthisis pneumonitis", likely asbestosis, in 1898. But no one knew of the connection of asbestos and lung disease back then. That would come later, in 1927.

In 1886 Charles Branton Manville, aged 44, founded the Manville Covering Company in Milwaukee, Wisconsin, making asbestos pipe insulation. His only real competition was the Johns Manufacturing Company, and Manville bought out their business west of the Ohio River in 1897, and then merged with them in 1901 to form the Johns Manville Company.

Charles' son, Tommy Manville, introduced numerous different asbestos items, achieving sales of \$40 million a year. Tommy was a prominent socialite and heir to his father's asbestos fortune. He made the Guinness Book of records with 13 marriages to 11 women! In 1927 Johns Manville went public as Johns Manville Corporation (JMC). In 1930, H.E. Manville was chairman until 1939 and served on the board of directors till the 1960s.

During the Second World War (1939-1945) the US mandated that asbestos be installed in ships around boilers and around hot water and steam pipes. After the war JMC added fiberglass to its portfolio of building materials. In 1972 they moved their headquarters from New York City to Denver, Colorado. They manufactured PVC pipe, fiberglass insulation, asbestos cement pipe and asbestos shingles.

# The roofing problem of this building has been solved



Johns Manville advertisement for roofing in 1921.

In 1970 W. Richard Goodwin was installed as president. Like so many other companies, they diversified. JMC diversified into real estate development, recreation, and irrigation systems. Profits that had been static for some years rose by 115% from 1970 to 1975. Then, all of a sudden, the board ousted Goodwin in 1976. No one knows why, but it was presumed that a conservative board disliked his casual, flamboyant style.

In 1981 JMC changed their name to Manville during a restructuring. The next year they declared bankruptcy because of asbestos related lung disease lawsuits.

In 1930 Dr. A.J. Lanza, of the Metropolitan Life Insurance Company, started a four-year study entitled "Effect of inhalation of asbestos dust upon the lungs of asbestos workers". In 1933 he recommended that JMC do dust counts at its plants. However, the vice-president and chief legal counsel, Vandiver Brown, corresponded with Lanza, asking him to downplay the negative implications of asbestos exposure. Brown suppressed the report. Half a century later, plaintiffs used this correspondence to win punitive damages.

Parallel British studies agreed with Dr. Lanza's studies; England passed legislation in 1931 to protect asbestos workers. Finally, in 1934, asbestosis was considered a disease under US workman's compensation laws.

Asbestos exposure causes asbestos related lung disease (ARLD), and cancers. There are two types of asbestos fiber. The first is serpentine asbestos or chrysotile (white asbestos), which is long and curly and can be woven. The second type is amphibole asbestos or straight fibers. There are five types of straight fiber: anthophyllite, actinolite, tremolite, crocidolite (blue asbestos) and amosite (brown asbestos). Chrysotile is the commonest commercially used asbestos, found in roofing, ceilings, walls, tiles, auto brake linings, seals and insulation. It seems that chrysotile is the most dangerous form.

Asbestos fibers are inhaled and damage the lung. Types of ARLD are:

- asbestosis (a pneumoconiosis like silicosis, and coalminers pneumoconiosis). This causes inflammation and scarring of the lungs leading to shortness of breath and cough
- pleural plaques (scars on the lining of the lung)
- benign pleural effusion (fluid around the lung)
- malignant mesothelioma (rapidly progressive cancer of the lung lining)
- cancer of the lung, usually 15 years or more after exposure. Smoking worsens the lung cancer risk from asbestos.

If you cough up asbestos fibers, you can also swallow them, causing exposure of the intestinal tract. Asbestos also increases the incidence of cancer of the pharynx, larynx, stomach, and colon, as well as the ovary.

Workers at risk for asbestos related lung disease and cancer are insulation and HVAC workers, boilermakers, construction trade, shipyard workers, US Navy veterans and firefighters (notably in the World Trade Center on 9/11/2001).

The first lung related suit by 11 workers came as early as 1929. It was settled out of court in 1933 for \$30,000 with a secrecy order. In 1947 JMC took out insurance with Travelers Insurance Company, which lasted for 30 years. In 1950s, JMC workers with asbestos contact started filing workman's compensation claims.

In 1963 Dr. I.J. Selikoff of the Mount Sinai Medical Center of New York estimated that 21 million Americans had been exposed to asbestos. He predicted 8,000-10,000 deaths a year for the next 20 years in asbestos workers and their family members. JMC had always refused to put any warning labels on any of their asbestos products. But that was until this report. The next year they put warning labels on all their asbestos products.

In 1973 after a lot of litigation JMC lost their final appeal in the US Appeals Court in an asbestos suit. The jury found JMC guilty of contributory negligence. The Court wrote a blistering indictment of JMC. In 1976 there were 159 suits. Two years later there were 792 suits, with an average settlement of \$21,000. Travelers Insurance Company refused to renew JMC's policy in 1977. JMC were forced to self-insure. (The courts would later make Traveler's pay anyway. Even in 2004 the US Bankruptcy Court for the Southern District in New York ordered Travelers to pay \$500 million to settle 600,000 claims). By 1979 JMC had 1,500 suits. JMC responded by suing the government to indemnify JMC for government shipyard workers in the Second World War and Korean War.

JMC was still putting on a cool, unconcerned front. In 1980 JMC's president, said to Forbes that asbestos and JMC were virtually synonymous and "the day asbestos isn't good for us, we'll get out of it". Obviously that day had passed a number of years before! By 1981 JMC defended 9,300 asbestos suits with an average settlement of \$42,000. The next year they filed for bankruptcy.

After five years, the formula the courts and JMC came up with was the Manville Personal Injury Settlement Trust (PIST), which is still active today. This was worth \$2.5 billion at the time, funded through cash; future earnings, stocks and bonds from the new Manville company; and insurance payments.

In 1988 Manville reorganized and returned successfully to the business of manufacturing building materials (though none with asbestos). US asbestos production in 1973 had been 803,000 tons; in 2015 it was only 360 tons. In 1990 PIST ran out of money, JMC agreed to add up to \$520 million to the Trust over seven years. Other asbestos trust funds have been started too. From all trust funds, \$18 billion has been paid to date (2018) and \$12 billion remains.

In 1994 the US Bankruptcy Act shielded Manville from any further asbestos liability. 1996 Manville tried to change their name to Schuller, but the next year stockholders agreed to revert to Johns Manville. In 2001 Berkshire Hathaway bought JMC. They still manufacture wallboard, insulation, roofing and siding materials for the building trade. JMC was in the DJIA from 1930 to 1982, over half a century.

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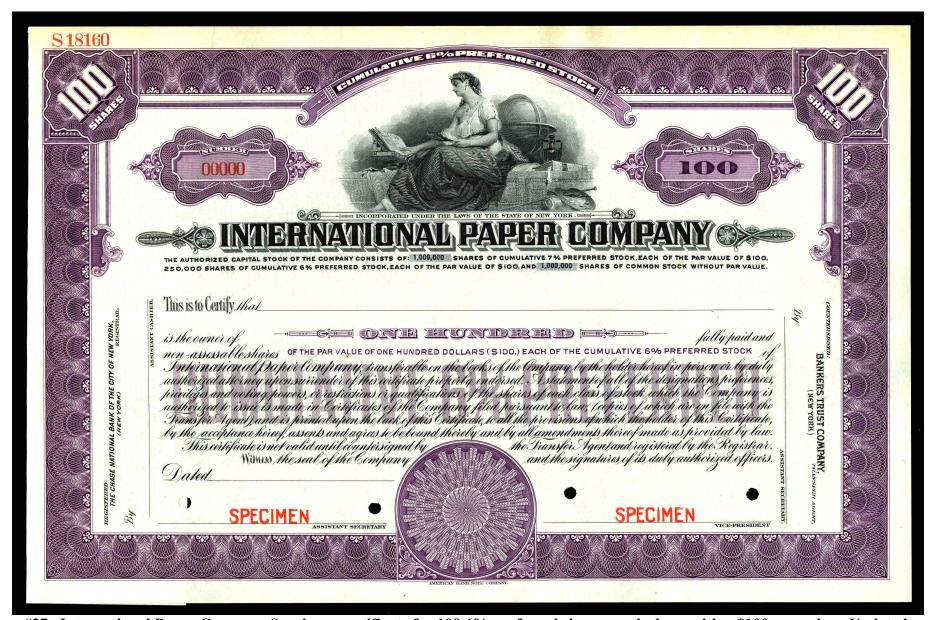
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By Johns-Manville Inc - Architectural Forum Vol 35 Issue 1, Public Domain,

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#27. International Paper Company Specimen certificate for 100 6% preferred shares, each share with a \$100 par value. Undated, unsigned, hole punch and stamp punched SPECIMEN cancelled. Serial number is 00000. Seal is just abstract art, the company was incorporated in New York, certificate printed by ABNCo.

#2094



Laureate female Allegory of paper with magnifier, book, pallete, globe behind.

In 105 CE Ts'ai Lun, a Chinese Imperial Court official, invented papermaking. He pounded the bark of a mulberry tree into fibers creating a sheet. Mulberry bark is mainly cellulose. Later, cotton fibers (also mainly cellulose) were added. In Egypt papyrus was used, and in Europe animal skins were used until Chinese papermaking gradually spread along the Silk Road. It reached India in the 600s. In 751 Arabs defeated the Chinese in the Battle of Talas River, in present day Kyrgyzstan. The Chinese taught the Arabs how to make paper, leading to the first Western paper mill in Samarkand (present day Uzbekistan). By the 11<sup>th</sup> century, papermaking started to spread to Western Europe.

Johann Gutenberg invented the first movable type printing press in 1453. These two revolutions - papermaking and movable type - led to a vastly increased availability of books in the West. Previously, European books were only available as very expensive hand-copied works on parchment (sheep, calf, or goat skin).

In 1898, 17 pulp and paper mills merged to form the International Paper Company in the Northeastern US, incorporating in Albany, NY. They supplied 60% of US newsprint. They had a million acres of timberlands and streams. The streams were used for hydroelectric power to power their mills. In 1903 they opened a research and development facility in Glens Falls, NY. But in 1913, Congress eliminated tariffs on cheap Canadian newsprint. This ended International Paper's newsprint leadership. Canadian paper was cheaper.

In 1928 International Paper changed their name to International Paper and Power Company. At the time they supplied enough power to light New England, Quebec, and Ontario! In the 1920s and 1930s they expanded more into the warmer southern states where trees grew faster. In 1935 Congress passed the Public Utility Holdings Act, to regulate electric utilities by either limiting them to a single state (thus subjecting them to state legislation) or forcing divestiture to limit their geographic coverage. Congress also declared it illegal to operate a power company and an industrial company together. So, in 1941 International Paper and Power merged with the Southern Kraft Company (which owned eight Kraft board and paper mills), sold off the power division, and formed a new company: International Paper Company (IP).



One Kuan Ming Dynasty note 1375 CE, printed on mulberry bark paper.

During the Second World War (1939-1945) IP developed nitrate pulp for explosives. They also made Victory board (now called V board, also called cement board) which was more like a building material. Cellulose from wood was mixed with cement. It was used for packaging for troop supplies. Today it is sold in 3' by 5' sheets ½" to ½" thick and commonly used as backing board for tiles, roofing, paneling, cladding, partitions, and flooring. It is fire, water and termite resistant. During the war it was used instead of wooden crates.

Around 1950, IP research developed the SuperTree<sup>TM</sup> by breeding out superior Southern Yellow Pines that grew faster and straighter and were more disease resistant. In 1962 IP started polyethylene coated milk cartons (previously they were soaked in wax). IP then sensibly diversified into construction, non-woven fabrics, facial tissue, and disposable diapers. They were all wood pulp products.

In 1970 they appointed Paul Gorman CEO. He decided to close all projects that made below in 10% after-tax profits. At the time IP owned eight million acres and had tried (unsuccessfully) to locate major oil or gas deposits on their lands. Around 1980 Edwin Gee, chairman, recognized that most of their mills and plants dated from the 1920s and 1930s and were inefficient. He decided to invest \$6 billion for modernization. But he could only raise about \$2.5 billion, by selling IP Canada, IP's General Crude Oil Company and some land. He found only two of six major packaging mills were efficient. Of the four inefficient ones he sold one, and shut down the other three.

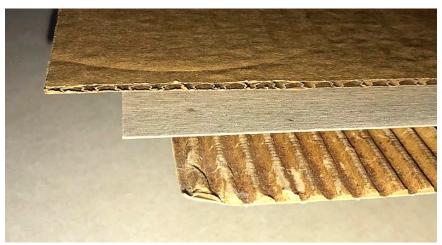
The paper manufacturing business is cyclical and in the early 1980s linerboard was low profit, but white paper was high profit. So, IP bought Anitec, a manufacturer of photographic paper and other supplies.

A few words about the paper business: Pulp is made by the Kraft process. Wood chips are mixed with hot sodium hydroxide and sodium sulfide. This breaks the bonds that link the lignin, hemicellulose and cellulose. The process was invented in 1879 in Germany ("Kraft" in German means strong). Initially mills simply disposed of the toxic chemicals, but later mills started recycling the toxic waste to remake the needed chemicals. Much paper is also now recycled.

Plain writing and printer paper are typically supercalendered. This is a finishing process using high temperature and pressure calender roller machines (which smooth paper, fabrics, plastics etc.). This makes the surface of the paper smooth. The paper can also be coated with polymers, china clay, bentonite, talc, resins etc. but coated paper is in a different class of paper and is more expensive. A ton of paper consumes four tons of wood, 55,000 gallons of water, 102 pounds of sulfur, 350 pounds of lime, 289 pounds of clay, 1.2 tons of coal, 112 kilowatt-hours of power, 20 pounds of dye and pigments and 108 pounds of starch, as well as other ingredients. Nevertheless, US and Canada forest acreage has grown over the last 20 years. Thus, green urgings like, "go paperless" or, "save trees" misleads consumers into thinking that paper consumption is a cause of deforestation, which it is not. Paper companies manage their forests well. But it takes a boatload of materials and energy to make paper.

Regular cardboard you see as a cereal box is called <u>paperboard</u>. The cardboard you see with a corrugated center is called <u>containerboard</u>. It is used to package heavier items and is more rigid. The inner part of containerboard is called corrugated board, and the two outer surfaces are called linerboard. Wooden pulp (almost all cellulose) can also be used to make pulp products like diapers. Wood chips and fibers can also be made into engineered board.

In 1908s IP realized specialty paper and wood products were more profitable. IP bought Avery Corporation that made envelopes; Kendall Company, that made non-woven fabrics; and Masonite that made wood composites.



Types of cardboard. Top is containerboard, middle is paperboard, bottom is corrugated board with one layer of linerboard.

In 1990 IP bought the French operations of Georgia-Pacific and started buying foreign companies to expand abroad. That decade they went on a buying spree, acquiring Federal Paper Board for \$3.5 billion in 1995, and Union Camp Corporation for \$7.9 billion in 1999, a competitor that made paper and containerboard. In 2000 IP acquired Champion International Corporation for \$5 billion. They had 5 million acres of US timberland, and made engineered wood products. IP then moved into Champions headquarters in Stamford, CT.

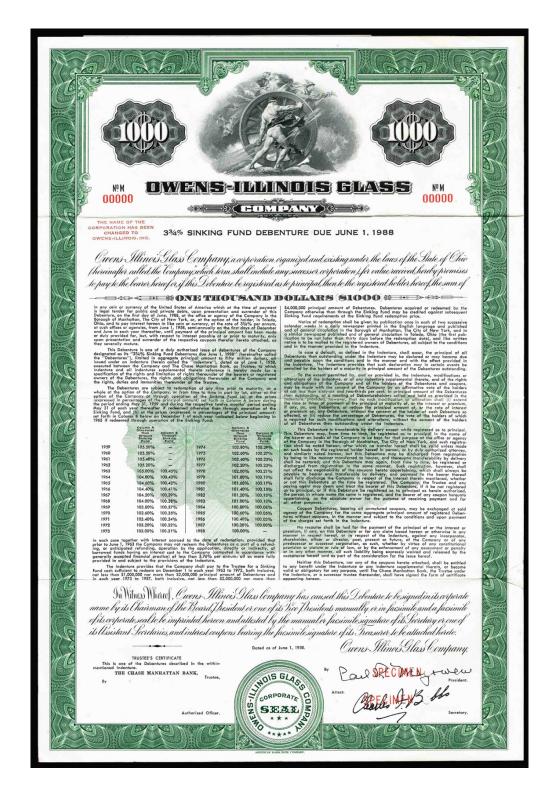
After this buying spree they had to pay for it. So they refocused on paper, packaging and forest products. They sold the rest, including petroleum and minerals businesses, land, hydroelectric power facilities, a water company and a flexible packaging company. It seems that many large corporations caught the conglomerate bug, then decided to focus more on their core competence.

In 2008 IP bought Weyerhaeuser Containerboard for \$6 billion. In 2012 IP built an office tower in East Memphis. Interestingly, IP frequently insulated their mills with asbestos because paper was so flammable, thus many employees developed asbestos related lung disease.

IP was in the DJIA from 1956 – 2004, almost 50 years. For 12 months ending September 2019 revenue was \$23 billion of revenue (80% from the US), profit was \$1.4 billion. Capitalization of \$17 billion in 2020. They employ 52,000 people in 24 countries. In 2017 they made 5 million tons of printing paper, 19 million tons of industrial packaging, and 4 million tons of pulp for disposable diapers and tissues. In 1960 US paper and paperboard consumption was 180 kg per capita, and in 2018 was 380 kg per capita. People thought computers would make us a paperless society. Not true!

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Previous page: #28. Owens Illinois Glass Company sinking fund \$1,000 debenture at 3.75% for 30 years from June 1958 to June 1988. This is a signed specimen certificate stamped SPECIMEN with serial number 0000.

It is also a bearer certificate i.e. payable not to a specific person but to whoever presents the certificate. Note also on the top left it says the name of the company has been changed to Owens-Illinois Inc. #1995

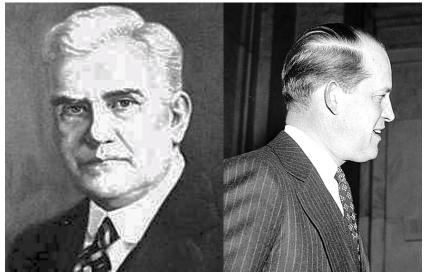


Vignette showing strong man turning a large wheel. Above him in the clouds are Hermes the messenger God and god of commerce, and two female Allegories one holding a torch and one holding a globe.

In the late 1800s Toledo, Ohio, with large supplies of sandstone and natural gas became an ideal location for glassworks. Numerous glass companies relocated to Toledo, including the New England Glass Company in 1888. That year the company owner, Edward Libbey, hired Michael J. Owens, who became the plant manager in Findlay, Ohio, 45 miles south of Toledo. Owens (1859-1923) apprenticed as a glass blower aged ten, and invented a very important machine.



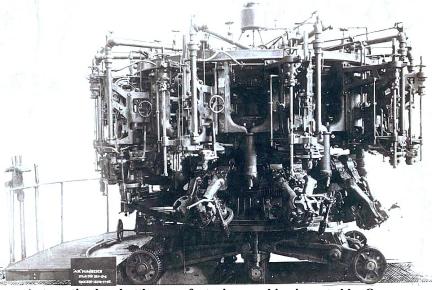
Location of Alton, Toledo, and Findlay.



Michael J. Owens, inventor.

O-I President Edward Levis 1938

At the time all glass bottles were hand blown. Owens patented an automatic glass bottle-manufacturing machine in 1904, which could make four bottles a second! This revolutionized the glass industry. Soft drink and beer companies could now more easily package and market their products. Owens' former boss, Edward Libbey, helped finance the Owens Bottle Machine Company in Toledo in 1903 to manufacture the machines. Libbey also founded the Libbey-Owens Sheet Glass Company in 1916, after buying out Irving Colburn's patents for the continuous manufacture of flat glass in 1912. The manufacture of sheet glass is a different process than bottles and jars.



Automatic glass bottle manufacturing machine invented by Owens.



Edward and Florence Libbey in 1901. He was father of the Toledo glass Industry

In 1919 the Owens – Libbey Company changed name to Owens Bottle Company as it now made bottles too. In 1929 they bought the Illinois Glass Company in Alton, Illinois (see map on previous page) for \$19 million. They and changed their name to Owen-Illinois Glass Company (O-I). Two years later they opened a branch in California, and bought the Illinois-Pacific Coast Company who also made glass.

William Eliot Smith (1844-1909) and Edward Levis (1819-1903) started the Illinois Glass Company in 1873. After initial success and expansion, the town leaders of Alton, Illinois just north of St. Louis, Missouri wanted to keep the company in town. They did not want to lose them to St. Louis, so they raised funds to buy land for them. Edward Levis, grandson of the founder, became the new Executive VP and General Manager of O-I in 1929, later becoming its President. In 1938 he testified for O-I before Government monopoly investigators. O-I was and still is the largest glass producer in the country.

In 1965 O-I changed their name to Owens-Illinois Inc. In 1973 the Alton plant had 2,400 workers and 31 bottle forming machines. But the plant closed in 1983 after 110 years of operation because of increasing competition from plastic and aluminum. Luckily O-I itself joined their competition in 1958, making plastic containers too.

Collectors collect old glass bottles and jars. Like coins, glass bottles tolerate burial well and manufacturers' marks and codes are the most common of all logos found in historical archeological excavations in post -1930s sites. Julian Toulouse worked his whole life for O-I and wrote two books for bottle collectors to identify their marks.

In 2005 to Owens-Illinois changed their name again to simply "O-I". Even today half of all glass bottles and jars are still made by O-I. They have operations in North and South America, Asia-Pacific, and Europe selling glass bottles and jars. From 1958 they sold plastic containers, closures, and prescription containers. But in 2007 they sold off their plastics packaging business to Rexam PLC, of England.

O-I was in the DJIA from 1959 to 1987, almost 30 years. Their market capitalization in 2020 was \$2 billion (small-cap companies have a capitalization of under \$2 billion and large-caps over \$10 billion. Thus, O-I now barely even makes it as a mid-cap stock, far from the heady days of being in the DJIA! Sales in 2018 were \$7 billion, and net income was \$257 million.

Modern descriptions of capitalization are:

- Nano-cap below \$50 million
- Micro-cap \$50 million to \$300 million
- Small-cap \$300 million to \$2 billion
- Medium-cap \$2 \$10 billion
- Large-cap \$10 \$200 billion
- Mega-cap over \$200 billion

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# **CHAPTER EIGHT**

# The ten largest American Companies today.

While collecting stock certificates for the Dow Jones collection, I wanted to add the top ten US companies. The top companies in the US and in the world can be looked at either in terms of their revenues, their profitability, or their capitalization:

## **Public Companies by Revenue Fortune 2018**

		2017 Revenue	Foreign
Rank	Name	\$ billions	or US
1	Walmart	500	US
2	Royal Dutch Shell	311	
3	Toyota	265	
4	VW	60	
5	BP	245	
6	ExxonMobil	244	US
7	Berkshire Hathaway	242	US
8	Apple	229	US
9	Samsung	212	
10	McKesson	208	US
11	Glencore	205	
12	United Health	201	US
13	Daimler	185	
14	CVS	185	US
15	Amazon	178	US

This shows that of the top 15 public companies in the world by revenue in 2017, five were American. However, revenue is only one aspect of comparing companies. Of course, Walmart may have the largest revenues, but their profits for 2017 were only \$9.8 billion.

## **Public Companies by Profit Fortune 2018**

		2017 Profit	Foreign
Rank	Name	\$ billions	or US
1	Apple	48	US
2	Brit Am Tobacco	48	
3	Berkshire Hathaway	45	US
4	Samsung	37	
5	Verizon	30	US
6	A T & T	29	US
7	JP Morgan Chase	24	US
8	Comcast	23	US
9	Toyota	23	
10	Wells Fargo	22	US
11	Pfizer	21	US
12	Microsoft	21	US
13	Exxon Mobil	20	US

This shows that of the top 13 public companies in the world by profits, ten are American. Although we can look at revenues and profits, they may be skewed at any one point in time, for example buying an expensive company might artificially depress net profit for the year. The sale of an expensive company might inflate the profits for a year.

Several top Chinese companies are larger than US companies. But the 12 largest Chinese companies are all majority state owned, including Alibaba and Tencent. I do not list international companies that are majority state owned, except in the next chart of largest companies by capitalization. The Chinese Communist Party placed group committees in large Chinese companies since 2012 and they embed officials inside these companies. These companies tend to be state protected Chinese monopolies.

## Public Companies by Capitalization 2018.

Rank	Name	Wikipedia 2018 cap \$ billions	Statista 2018 cap \$ billions	Symbol surfing 2018 cap \$ billions	Decemb er 2018 cap \$ billions	Foreign or US
1	Apple	1091	927	1037	744	US
2	Alphabet	977	766	496	708	US
3	Microsoft	877	750	944	779	US
4	Amazon	840	778	679	714	US
5	Berkshire Hathaway	524	491		476	US
6	Facebook	474	541	383	383	US
7	Alibaba	424	499	367	350	
8	Tencent	388	491		360	
9	JP Morgan Chase	379	387	381	321	US
10	Johnson & Johnson	370	341	359	344	US
11	ExxonMobil	344	344	363	291	US
12	Samsung	314	325		351	US
13	Bank of America		313		248	US
14	Pfizer			296	243	US
16	Home Depot			289	185	US

This shows that of the 16 largest capitalization public companies in the world 14 are American. But just because the market values a stock does not mean the company is great, as all Bernie Madoff's investors will now tell you. The two that are not are majority state owned run by the Chinese Communist Party.

A look at Tesla is instructive when it comes to market capitalization. Tesla struggled to produce 367,500 cars in 2019. This represents 4% of GM's output of 8.4 million vehicles in 2018. Yet Tesla's capitalization in 2020 was \$86 billion versus GM's \$50 billion. Tesla was previously Consumer Report's number one rated car in satisfaction. In December 2018 they scored way down (27<sup>th</sup> out of 29 makes in reliability ratings), suggesting manufacturing problems.

Facebook was capitalized at \$621 billion in 2020, but had revenues of only \$41 billion, with net profits of only \$18 billion for year ending September 2019. This is 2.9% income on its capitalization – hardly a bonanza. The drip, drip, drip, of revelations that Facebook share private data with other companies, the

Cambridge Analytica debacle, and the fact that young people prefer other social media platforms places Facebook as a company whose time may have peaked.

Thus, although I list a subjective top ten companies for 2018, that in no way predicts the future. Indeed, it is highly likely that this will change in even a year or two. Business is dynamic and changes. Capitalization reflects the stock market's expectation today; it cannot predict the future! Some mammoths of yesteryear like Sears and Kodak fell rapidly from grace.

Many feel that investment companies and banks are simply intermediaries with falsely bloated capitalizations provided by investors. These are the sorts of factors to be considered when making a list of the top ten US Companies.

Top American Public Companies by various criteria.

	Top 10	Top 10	Top 10
	Revenue	Profit	Capitalization
1	Walmart	Apple	Apple
		Berkshire	
2	ExxonMobil	Hathaway	Microsoft
3	Apple	Verizon	Alphabet
4	McKesson	AT&T	Amazon
5	United Health	JPMorganChase	Facebook
6	CVS	Comcast	Johnson <sup>2</sup>
7	Amazon	Pfizer	Exxon Mobil
8	A T & T	Microsoft	Pfizer
9	GM	ExxonMobil	Home Depot

A tentative list of the current top ten US companies follows:

- 1. Apple
- 2. Alphabet (previously Google)
- 3. Amazon
- 4. Microsoft
- 5. Walmart
- 6. ExxonMobil
- 7. A T & T
- 8. Pfizer
- 9. GM
- 10. Facebook

If you want to include investment companies and banks then one would have to include Berkshire Hathaway, JP Morgan Chase and Bank of America.



#1. Apple Computer Inc., unissued, unsigned, specimen common stock certificate, punch cancelled with SPECIMEN | +4.1989 | USBN SECOL. The seal shows incorporation in California in 1977. #1924

In 1975 the first commercially successful microcomputer, the Altair 8800, appeared. The next year Steve Wozniak made his own computer while he was an intern engineer, designing calculators at Hewlett-Packard. HP said they were not interested. So, Steve Wozniak and Steve Jobs, both college dropouts, started what would eventually become the largest commercial company in the world. Together with a brief partner, Ron Wayne, they founded Apple. Their first product was an Apple I, which sold for \$666 at the time and was a complete personal computer (with a separate screen).



The Apple I hand made by Steve Wozniak in 1976.



Steve Jobs' double garage where Apple computers started, now an historic site.

The next year in 1976, Wayne sold his share back to Jobs and Wozniak for \$800! Good Lord! He must have kicked himself!! Steve Jobs then persuaded Mike Markkula, a wealthy veteran of Intel Corporation, to act as an investor and business guide. He invested \$250,000. By 1980 Apple sales were \$118 million.

They introduced the Apple II in 1977. At the time its rivals were the RadioShack TRS 80, and the Commodore PET. Initially they used cassette tape as a storage media. (The word Apple incidentally had been chosen as something you could take a byte out of – a play on words). I recall in June 1977 joining an internist in the US who had designed his own billing program for the TRS 80. All the information was kept on cassette tapes. He was truly ahead of his time. His print outs were on perforated paper using a pin matrix printer.



Apple II launched in 1977, before graphic user interface, note alphanumeric symbols only and no mouse.







Steve Jobs in 2010

Apple soon replaced cassette tape with large floppy disks, allowing easier access to all information needed. A spreadsheet program called VisiCalc gave Apple a business market. But business penetration was poor. In 1981 IBM launched the IBM PC with the Lotus 123 spreadsheet program. Businesses liked it. Apple gave aggressive discounts and donations to schools and universities propelling their success in educational institutions. In 1984 Apple partnered with Adobe who created PageMaker, a desktop publishing program. They also made the LaserWriter, the first cheap laser printer in 1988. Apple now had the publishing and education market; PCs had the business market.

In 1979 Xerox allowed Apple three days of full access to their facilities in return for an option to buy 100,000 shares at \$10 a share before the IPO. Jobs lifted the idea of their GUI (graphic user interface). At the time IBM used MSDOS and a monochrome alphanumeric display only. To move something into the trash you had to know exactly which letters to type to perform the function. GUI just allowed you to click and drag a document and unclick over a picture of a trashcan. This was much more intuitive, but was more expensive on computing hardware and was initially seen as a toy, rather than something serious.

In 1980 Apple introduced the Apple III to compete with the IBM PC and Microsoft in the business market. But Apple had also launched another product, Lisa, which was much more expensive and had limited software. It sold poorly until Apple launched the Macintosh ("Mac") in 1984.



Apple's 1984 Macintosh Computer with GUI, advertised in the Super Bowl.

It was during the December 1983 Super Bowl that a 60 second TV advertisement (which cost Apple \$1.5 million) took the viewer to a vision of George Orwell's 1984. In the last 10 seconds the master of the universe was blown up. A voice, and words came on the screen saying "On January 24th, Apple Computer will introduce Macintosh. And you'll see why 1984 won't be like 1984". They called the advert a masterstroke of genius. It did the trick.

In 1983 Apple hired John Sculley as CEO. A power struggle in 1985 led to Jobs' resignation. Jobs left to found NeXT Inc. and later bought Pixar, the computer animation company. Apple's policy then was 55% profit margin on their computers. But this priced Macs too high. IBM's PC could easily compete with similar functionality at lower price points. In 1985 Wozniak, tired of corporate life, left. He remained ceremonially involved with Apple, invented the first universal remote, and focused on technical education in K-12 schools. He has an unusual condition prosopagnosia, or the inability to recognize faces. Many victims ask their spouses to wear an easily identifiable piece of jewelry.

In 1988 Apple brought suit against Microsoft for stealing the GUI. However, the case dragged on until the final verdict in 1994, which Apple basically lost. After all, they themselves had lifted GUI from Xerox. Ten years later Apple and Microsoft entered a patent cross-licensing agreement.

Profits deteriorated in 1989. In 1991, Apple introduced the PowerBook and added color and a new operating system. They tried other consumer targeted products like digital cameras, TVs, portable CD players etc. But its software needed more powerful hardware, sales were poor, and their stock slid.

In 1993 Apple introduced their first PDA (Personal Digital Assistant) the "Newton" palm top. It flopped but paved the way for iPhone. The next year Apple allied with IBM and Motorola, to form the AIM Alliance. This was an unlikely alliance. It tried to compete with Microsoft, but really went nowhere. In 1996 Apple's new CEO, Gil Amelio, decided to bring back Steve Jobs. Apple bought Jobs' NeXT operating system. But Apple stock was doing poorly. The board ultimately replaced Amelio with Jobs in 1997. Jonathan Ive, a very talented industrial designer, appeared, responsible for so much of modern Apple's look. Today, Apple is synonymous with iconic industrial design.

In 1998 Apple introduced the iMac, an all in one computer, then started a series of software acquisitions to put iMovie, iDVD, iPhoto, iLife, and other programs into Apples. Two years later Steve Jobs got Microsoft to create MS Office for Mac – a win-win strategy for them both. The next year Apple opened their first Apple stores and started iPod, selling 100 million units in 6 years. In 2003 Apple started iTunes and within five years they had sold over 5 billion downloads. In 2006 Apple went over to Intel as their chipmaker.

In 2007 Jobs announce that Apple Computer Inc. would change its name to Apple Inc. to reflect their focus on consumer electronics. The same year they announced their first iPhone for \$499, a smart phone which could not use the

latest third generation wireless networks. Apple rectified this nine months later with their iPhone 3G for \$199. In 2008 Apple launched the App Store, to buy programs that ran on smart phones, though many programs were free. By year's end Apple was #3 in word phone sales – not bad for having been in the market for only 18 months! The same year Apple announced they would no longer attend trade shows because their Apple Stores had become so successful.

In 2010 I finally switched from PCs to Apple. Each time I complained about the recurrent crashes, interminable calls to India, and waiting on hold, my three daughters told me to switch to Apple. I feared the learning curve. But I should not have. As soon as I got an iMac, I never looked back. Gone were the constant crashes, now an occasional problem was solved within 10 minutes on the phone with someone fluent in English. And I simply used MS Office for Mac. I realized Apple wanted superlative service, and designed better products.

In 2010 Apple released the iPad, and iPhone 4. The next year Steve Jobs announced iCloud, an on-line storage system. That year Apple's financial reserves briefly passed those of the US government!

Jobs had a rare type of pancreatic cancer. The usual type is adenocarcinoma, i.e. cancer of the cells that line the pancreatic canals that produce digestive enzymes. Jobs had an islet cell cancer i.e. one of the cells that produce hormones like insulin, or glucagon, also called neuroendocrine cancers. These make up only 1-3% of pancreatic cancers. Doctors first diagnosed Job's cancer in 2003. Had it been adenocarcinoma he would likely have died within 6-12 months. However, with his islet cell carcinoma he survived eight years. In 2009 Jobs had a liver transplant, possibly because of recurrent cancer that had spread (metastasized) to the liver.

In 2011 Apple introduced iPhone 5. They introduced Siri, to answer questions, just by speaking rather than typing into the phone.

Tim Cook took over from Jobs. The next year Apple introduced iBooks Textbooks. For a college student doing five courses a semester, textbooks each semester can approach \$1,000. Apple came out with a new iPhone roughly every year. Everyone wants the latest thing! In 2014 Apple Pay started, but the hoped for financial revolution has not happened yet. In 2016 a billion Apple devices were in active use. In 2017 Apple introduced the Home Pod, a smart speaker. You could speak to it and it spoke back. It could answer questions, control devices in a connected house (called "internet of things"), or play music. This competed with Amazon's and Google's smart speakers, but was pricier.

Apple is a monopsony i.e. a market in which there is only one buyer. If any suppliers balk, they will end up on the garbage heap. Most Apple products are built outside America. Foxconn is a particularly large Chinese supplier whose working conditions have come under fire in the press for worker suicides, and child labor. Apple has responded by issuing guidelines to its suppliers, but enforcement has been difficult to gauge.



Iconic iPhone XS, which came out in September 2018, taken from apple.com.

Apple's products are:

- iMac, an all-in-one computer
- Laptops, like MacBook and MacPro
- iPod
- iPhone
- iPad
- Apple watch, increasingly used for health applications
- Apple TV
- Home Pod (smart speakers)
- Software
- iCloud
- App store especially iTunes
- Apple Stores

Apple, together with Google, Tesla and Uber are all trying to produce a safe autonomous electric vehicle. Apple Energy LLC is a subsidiary that sell solar energy.



Apple Campus and Headquarters in Cupertino California, note solar roof, parking is underground.

Apple has complied with environmental laws, using solar power and renewable energy. They package with recycled paper, and introduced a robot, Liam, who disassembles old iPhones and recycles parts. Apple has also stopped using toxic chemicals in manufacturing e.g. arsenic and PVC.

For many years Apple evaded paying the US 35% corporate tax by creating subsidiaries in Ireland and the Netherlands. US corporate taxes were among the highest in the world at 35%. Only four countries had a higher rate: United Arab Republic 55%, Comoros 50%, Puerto Rico 39%, and Suriname 36% - hardly large developed countries. It was thus not unnatural for Apple to seek lower taxes. In 2012 an English Member of Parliament, Charlie Elphicke, said Apple was paying an effective tax of 3% in England, and that Google, Coca Cola and others followed similar practices. In 2014 Apple established a tax residency in Ireland to reduce taxes. In 2016 the EU fined Apple \$14.5 billion plus interest for unpaid taxes – the largest tax fine in history.

US President Trump signed the "Tax Cuts and Jobs Act" in December 2017, which changed US Federal income taxes starting in 2019. More importantly, the act lowered the Federal corporate tax from 35% to 21%. But if Apple can get away with 3% corporate tax it is still unlikely to return its headquarters to the US. The tax reduction may encourage more borderline businesses to locate in the US rather than abroad, though it may take decades before the federal government will recoup the tax losses. The Federal Government is a lumbering giant, not nimble enough to respond with optimal tax structures.

In 2018 49% of Federal tax was from income tax, 36% from social security taxes, and 7% from corporate tax (and 8% "other"). In 2017 corporate tax income was \$297 billion. The Office of Management and Budget estimates 2019 corporate taxes will be \$225 billion (a 24% drop, when the tax rate dropped from 35% to 21%). But corporations often pass on tax burdens to consumers. If profit margins fall below what stockholders want, companies can raise prices to consumers. Thus, lowering corporate taxes will ultimately encourage more businesses to locate in the US, and result in lower prices to consumers. Hopefully, over a period of years, tax revenues will increase when US companies relocate their headquarters to the US.

Apple was the first US company to reach a capitalization over \$1 trillion. Revenue in 2018 was \$266 billion, and profits were \$60 billion. Thus, the profit margin, or net profit ratio is 23%, an amazing figure for any large company. They employ 132,000 people. Apple replaced AT & T in 2015 in the DJIA, so has only been in the DJIA for five years and does not have a long existence as a top performing company like many of the others we have dealt with in this book.

Of course, China does not host a level playing field for foreign companies. They steal industrial secrets and patents, and insist that foreign companies who produce in China yield its secrets. The Chinese company Huawei has risen to the #3 phone company in the world in only a few years. In December 2019 Samsung had 21% of the international phone market, Apple 22%, and Huawei

8%. In January 2019 Huawei demoted, and lowered the salaries of some Huawei employees who had tweeted using an iPhone instead of a Huawei phone. Apple currently has about 20% of Chinese mobile phone market, which will likely shrink as Chinese manufacturers push Chinese phones. Trump instituted a trade war with China, and focused on Huawei, a Chinese technology company promoting 5G (fifth generation cellular wireless).

The Chinese communist dictatorship uses technology extensively to monitor and restrict its people. Facial recognition cameras everywhere, Internet monitoring and restriction, and its imprisonment of around 1 million Muslim Uighurs for "re-education", testify to a police state. Western entertainers and businesses must censor all of this to do business in China, or risk losing it. The conundrum for the rest of the world is whether to rely on cheap Chinese Huawei 5G technology, or whether doing so will result in China stealing even more political, economic, military and industrial secrets, while spying on other nations.

In January 2019 the US Department of Justice charged Huawei with bank fraud and stealing trade secrets. They charged Huawei's chief financial officer, the owner's daughter Meng Wanzhou, a Canadian resident, with a laundry list of crimes. These crimes included money laundering, conspiracy, and bank and wire fraud. Canada arrested her and is deciding whether to extradite her to the US.

The US Federal Communications Commission said ties between Huawei and ZTE and Beijing create concerns. Australia, New Zealand, US, and England all refuse to accept contracts with Huawei for sensitive information. There is a Communist party committee in Huawei, as required in all Chinese companies. Huawei absolutely deny that China will use them to spy on foreign countries. But China is a dictatorship! Nevertheless, many European countries say they will buy Huawei's 5G network, and that the risk is manageable.

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2. Google Inc. Stock Certificate for one share issued to Larry Falater, dated April 2006. The seal shows Google was incorporated in Delaware in 2002. The certificate is uncancelled. It was printed by the United States Banknote Company. #2071

In 1995 Stanford University assigned Sergey Brin, a graduate Ph.D. student, to show Larry Page around the campus. Page was considering Stanford for his graduate studies. They did not hit it off at the time, but did later. The next year they theorized about a better search engine than a simple ranking of how many times search terms appeared on a page (which was how all engines did it then).



Brin and Page called their new technology PageRank. It determined a website's relevance by the number of pages, the importance of those pages, and the number of links each website had. They named the search engine after  $10^{100}$ , called googol, which they re-spelled google. They felt it showed that they sifted through huge quantities of information.

They registered Google in 1997 based in Menlo Park, California in a garage of a friend, Susan Wojcicki. She became Google's marketing manager and is now CEO of YouTube. Susan's sister, Ann, was Sergey Brin's first wife.

In 1998 Andy Bechtolsheim, co-founder of Sun Microsystems (an early hardware and software company), contributed \$100,000 to Google. Jeff Bezos and two others also contributed. The next year venture capitalists contributed \$25 million. There were many search engines at the time e.g. Excite (started 1993), Yahoo (started 1994), and WebCrawler (started 1994). But Google was different. In 2004 they became the number one search engine and had an IPO raising about \$1.7 billion. After the IPO, Google's market capitalization was \$23 billion. By 2020 Alphabet (Google's parent company) reached 986 billion.

To create and maintain its corporate culture Brin and Page designated a Chief Culture Officer, who was also head of Human Resources. Company culture is very important and often ranks as a cause of a company's success. More about Google's culture later.

In 1999 Google moved to Palo Alto, CA. The next year they started selling advertising, which the founders had originally said they would not do. In 2001 Google got a patent for their PageRank system. Google now claims 70% of World net searches amounting to over a trillion searches a year. The same year Brin and Page were persuaded that they needed a CEO. They hired Eric Schmidt, who inexplicably stepped down in late 2017. Some say he was a serial womanizer (despite being married), which was not politically correct for Google. As a huge Hillary Clinton supporter and contributor, another possibility was that he wanted to get into politics, and saw an opportunity at the time.

In 2003 Google moved to Mountain View, CA where their complex became known as Googleplex (googolplex is 10<sup>googol</sup>).



Googleplex Headquarters in Mountain View, California.



Googleplex courtyard in Mountain View, California.

Like so many companies Google acquired many others to enhance their products and to enhance their patent portfolio. The business model of Google seems to be to supply free software to consumers, knowing they will become advertising recipients; and to do the same to business knowing that they themselves will use Google to advertise. 96% of Google's revenue comes from advertising on all its platforms like Google Search, YouTube, Waze, and so forth. Google Analytics determines charges by the number of clicks by customers on advertising links. However, some claim 14-20% of clicks are fraudulent.

In 2003 Google bought Applied Semantics, who had developed AdSense, which was used for Googles advertising. The next year they bought Keyhole which they renamed Google Earth. In 2006 Google bought YouTube. Four years later Google Energy was formed with windfarms in North Dakota. Google also bought Global IP solutions for web-based teleconferencing.

In 2011 they spent \$12.5 billion to buy Motorola for their patent portfolio, and especially mobile phone operating systems called Android. In 2013 Google bought Waze for \$1 billion. This is a GPS system that uses crowdsourced warnings of police (making radar detectors effete), potholes, accidents, traffic jams, road changes, etc. In 2014 Google acquired DeepMind Technologies, an artificial intelligence company.

In 2015 Google reorganized as Alphabet with Brin as President and Page as CEO. Google became a subsidiary of Alphabet. In 2016 Alphabet announced they would power all of their data centers in North and South America, Europe, and Asia with 100% renewable energy estimated at 2.6 gigawatts (presumably 2.6 gigawatts per hour).

A list of some of Google's products and subsidiaries follows:

- Gmail for email
- Google Chrome internet browser (surpassed Microsoft Explorer)
- Google Assistant (voice activated browser)
- Google Home (voice activated intelligent speaker)
- Calico a longevity research company
- DeepMind (Artificial intelligence)
- Nest (home connectivity products like thermostat)
- Waymo autonomous vehicle technology
- Cloud computing
- Android operating system for smart phones
- Google Earth and Google Street View
- Google Energy (windfarms and solar cells)
- Google Docs (word processor, spreadsheet, photo-editing, business software and presentation software all free)
- Google Plus (a social media program launched 2011 to compete with Facebook and decommissioned 2018 because of a massive data breach)
- Google Books which have scanned and uploaded US, UK, Canadian, and Australian books whose copyright has expired. Millions of books have been uploaded.

- Google is partnering with France on a transatlantic undersea cable.
- Google Fiber creates superfast connections in communities.
- In 2004 Google started a philanthropic organization to advocate for climate change, world poverty, and world public health. In 2012 Google promoted gay rights with a campaign called "Legalize Love".
- Verily is a life sciences research facility; Chronicle is cybersecurity; Dandelion is heat pumps; X Development is a secret R&D company.

Fortune Magazine and others have repeatedly quoted Google as the best company to work for with their corporate culture, which used to include a motto "do no evil", now reiterated as "do the right thing". Employees know there is no need to wear a suit, and that work will be challenging and fun. Also employees can spend 20% of their work time on projects that interest them, this is called "Innovative Time Off".

Employees on campuses have access to free food, exercise rooms, washers and dryers, massages, and various games. Google has campuses in Mountain View, CA; New York City; Ann Arbor, MI; Pittsburgh, PA; and other cities. It has over 78 offices in over 50 countries. It just sounds so idyllic doesn't it!

Well like so many things Google is not perfect:

- Google funnels non-US profits through Ireland and Netherlands. This lowered its non-US tax rate to 2.3%. In 2017 Google paid 19% taxes on US income (Microsoft paid 16.5% and Apple 25.8% on US profits this was all before corporate taxes were cut from 35% to 21% starting in 2018). Hopefully the tax cuts will result in more jobs in US, and more US corporate tax income, though that could take many years.
- In 2012 Google ranked second in campaign donations amongst technology and internet companies speaking to abundant political lobbying.
- In 2017 the European Union fined Google 2.4 billion euros for putting their shopping comparisons at the top of search results.
- Google has agreed to China's censorship policies to establish a Chinese search engine ("Dragonfly") despite the Chinese history of intellectual property and patent theft and being a communist dictatorship.
- In 2017 Google lied about click fraud refunds and has been sued several times for click fraud.
- In 2017 Google, who had long espoused an open policy for employees to voice concerns, fired James Damore, who wrote an analytical eight-page memo criticizing Google's bias on diversity and inclusiveness. Google fired him the same day accusing him of "advancing harmful gender stereotypes".
- In 2017 Google, responding to employees' desires, decided to terminate a US Department of Defense contract to improve drone software.
- In 2018 Google 20,000 employees staged a walkout to protest a golden parachute exit of Andy Rubin, the father of Android. According to a New York Times article, Rubin had coerced a female employee to perform oral sex in a hotel room in 2013. Google investigated and found her claim credible. Instead of firing Rubin, Google's Larry Page asked him to resign,

wished him well, and gave him \$90 million. Rubin claimed he never coerced the lady in question, and that it was part of a smear campaign by his ex-wife. Two other executives had also been accused of similar sexual misconduct and handed huge payouts.

- In 2018 the European commission fined Google \$5 billion for violating the EU's anti-trust rules by forcing Android manufacturers to install the Google search app and Google's Chrome Web browser. Google countered saying users could easily remove the apps and install others.
- In 2018 Google cancelled an artificial intelligence research project with the Pentagon while opening an artificial intelligence center in China, which will undoubtedly benefit the Chinese but not the US military.
- Many have criticized Google's lack of patriotism and twisted reasoning calling into question Google's motto "do the right thing".
- Hosting 70% of the world's internet searches makes Google a monopoly.
- In 2018 the US Securities and Exchange Commission mandated that companies report CEO and median worker salary. Larry Page conveniently makes only \$1 a year; the median Google worker salary is \$197,000 a year. (Google paid Page with stock his 2020 net worth was \$58 billion!)

Just to develop further the culture of Google, so important to its success, I would like to summarize the eight-page memo that James Damore circulated at Google, which resulted in his being fired. To me this is analogous to the problem that America faces today: the confrontation between left and right, and the inability of Americans, even within families, to communicate across the divide.

## Summary of Damore's Memo (Damore's views, not necessarily my own)

Fellow Googlers have expressed gratitude for my (Damore's) bringing up the Google culture of shaming and misrepresentation. They agree but would never express it, in case they were fired. Google shames employees into silence rather than risk offense. This leads to a lack of honest discussion.

People generally have good intentions, but we all have biases invisible to ourselves. However, these can be softened by open and honest discussion.

Google is left leaning. (Damore gives a summary of the differences between left and right thinking but sounds more like a libertarian to me). Neither left or right is 100% correct. Contrary to each side's dug-in view, both viewpoints are necessary for a functioning society or company. Google's left bias has created a politically correct monoculture that works by shaming dissenters into silence.

Google tell employees that biases hold women back in technology and in leadership. But men and women differ biologically as two overlapping bell-shaped statistical distribution curves:

- Women are more open, and extraverted. They prefer people to things, and are more cooperative.
- Men strive for status, seeking higher paying, less satisfying, and riskier jobs (93% of work related deaths occur in men). Men prefer things to people, are more competitive, and less cooperative.

Google has been reverse discriminating. For example, their programs, classes and mentoring are only for people of a specific gender or race. Google has special treatment for "diversity" candidates, like lowering hiring bars for them. These practices actually increase rather than decrease race and gender tensions. Damore suggests:

- De-moralize diversity i.e. treat it as a costs and benefits equation, not by shaming anyone who disagrees.
- Stop alienating conservatives. If you do, they will become closeted to avoid hostility. Rather, empower them to express their views.
- Stop restricting programs to specific gender and race.
- Discuss costs and benefits of Google's diversity programs openly and honestly.
- Focus preferentially on psychological safety rather than diversity.
- De-emphasize empathy for diversity issues. (Earlier he says Google regards all women's problem as female oppression, and all male problems as misogynistic whining).
- Prioritize intentions, and stop micro-aggression sensitivity training.
- Be open to the differences between people of different genders and races rather than homogenizing them.

Damore says to dismiss these observations would be to dismiss half of America. Over time, half of America has voted left and half of America has voted right. It is true that one half could be wrong. But to ignore this dichotomy, as Damore says, puts a society (or a company) in peril.

Culture problems aside, Alphabet's revenues in 2019 were \$155 billion, with a net income of \$31 billion. Google had over a trillion searches in 2018. In 2018 they employed 94,000 people. Alphabet's 2020 capitalization was \$986 billion.

CNBC said "both Google parent Alphabet, and Amazon probably will never be in the DJIA because their share prices are just too high. To include them would tip the scales heavily in the DJIA 30.... "Admitting Alphabet and Amazon into the DJIA would be like putting an elephant on the other side of a seesaw from a poodle". DJIA is a price weighted average, so that Alphabet and Amazon, each over \$1,000 a share would skew the average. Instead Alphabet and Amazon are listed in NASDAO.

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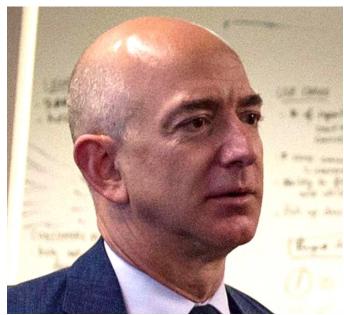
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3. Amazon Stock Certificate for one share of Common Stock issued October 2001 to Mr. and Mrs. Falater, uncancelled. The company was incorporated in Delaware, and the certificate is signed by Jeff Bezos. This shows the old Amazon logo of the river, before the arrow between A and Z (see next page).

#2054



Jeff Bezos, founder of Amazon.

Jeff Bezos, a computer engineer by training, left an executive position at D.E. Shaw & Co., a Wall Street hedge fund, in 1994. He knew the Internet was expanding rapidly and wanted to get in on the ground floor. He moved to Seattle to start his own business, which he called Cadabra Inc. A few months later a lawyer he spoke to misheard Cadabra as cadaver! Not wanting to do business as Cadaver, he picked up a dictionary and selected Amazon as an exotic and different place. The river was the biggest in the world and he intended his bookstore would be the biggest in the world. He made a shortlist of 20 products he could market on line, which he then narrowed to five: CD's, computer hardware, software, videos and books. So he started with books.

Early on Bezos used Barnes and Noble, the bookstore, as a business meeting place! His parents invested \$250,000 with him. He opened in 1994 with a few employees, and every time a book sold a bell would ring. Within weeks the bell was ringing all the time and had to be turned off! My son-in-law worked in fish wholesaling, and also had a large bell which anyone in the sales team got to ring if they made a sale, a form of positive reinforcement. Within two months in his garage, Bezos was selling in 45 countries with sales of \$1 million a year.

Book distributors in those days insisted that retailers order ten books at a time. Amazon could not afford this, so a wily employee discovered that an obscure book on lichens was always out of stock, so whenever Amazon ordered a book, they would order one, and nine of the out of stock lichen books!

Employees knew Bezos for his explosive sarcastic outbursts, so much so that he hired a coach to tone himself down. Like many entrepreneurs, he started in his garage. Bezos developed the mantra "Get Big Fast". To him every day was like

day one of a start-up. Bezos requires all high level employees to present information in a six-page narrative, and refuses power points and emails. He feels people who cannot tolerate criticism should not do anything new or interesting. In 1992 he married Mackenzie Tuttle, a novelist who was a research assistant at D.E. Shaw. In September he announced he intended to donate \$2 billion to help American homelessness (1.3% of peak net worth). Even Bill Gates took years before he started donating in earnest.

In 1997 Bezos floated an IPO raising \$15 million. The next year he bought the Internet Movie Database, and moved beyond books to music and videos. Barnes and Noble sued him because he claimed to be the world's largest bookstore. Bezos got his own back suing Barnes and Noble for using his patented one-click checkout system in 1999. Contemporary business analysts and journalists were skeptical of Bezos, calling his company Amazon.bomb (a play on Amazon.com)! Bezos knew he wanted explosive growth, and he got it. Sales were \$15.7 million in 1997, \$148 million in 1998, and \$610 million in 1999.

In 1998 he started the "Associates" program where outside merchants could offer merchandise on Amazon's platform, and Amazon would fill the order and pay a commission. In 1999 Time Magazine named Bezos Person of the Year recognizing that he had popularized online shopping. By then Amazon was selling hardware, toys, electronics, books, music and videos. Walmart also sued Amazon saying Bezos stole trade secrets by hiring former Walmart executives.



In 2000 Amazon changed their logo from the river flowing through the A as seen on the stock certificate, to the well-known curved arrow which means they sell everything from A to Z. Amazon plowed back all profits into the business to expand rapidly. They declared their very first profit - \$5 million on \$1 billion of sales in 2001 – i.e. only ½%, after seven years in business.

In 2005 Amazon launched Amazon Prime, a free shipping for certain purchases within the contiguous United States for \$79 a year, adding free videos later. Amazon also makes their own films. In 2006 they launched Amazon Web Services (AWS) as a subsidiary. The same year they launched fulfillment by Amazon, allowing small businesses to use Amazon's platform. In 2007 they launched CreateSpace, allowing authors to self-publish and sell their books on demand on Amazon. The same year they launched Amazon music, the Kindle for eBooks and AmazonFresh – a grocery service. Within four years Amazon, a bookseller, was selling more eBooks than hard copy books! That year, Amazon started construction of its Seattle headquarters.



Amazon Spheres at Amazon Campus during construction 2007-2011 in Seattle, WA, now a tourist attraction.

In 2011 Amazon introduced Amazon locker, allowing people to get goods delivered into a locker. Many lockers are now located in Whole Foods stores. The next year Amazon bought Kiva Systems, a robotics company that made robots to move items around a warehouse. In 2013 Amazon launched in India, having been locked out of China in 1998. Jack Ma started a similar online retail company called Alibaba. In 2014 Amazon introduced Alexa, a voice controlled smart speaker. Two years later Amazon made its first successful drone delivery in Cambridge, UK. Amazon has acquired many other companies and now has over 40 subsidiaries. They also compete in developing self-driving vehicles.

In 2017 Amazon acquired Whole Foods for \$14 billion, the expensive supermarket chain that some have dubbed "Whole Paycheck". This gives Amazon a prime location network of 431 stores for wealthy urbanites, and gets Amazon into the food business. The food business, traditionally very low margin, could be Amazon's Waterloo. Or it could propel them into a higher margin consumer convenience area of food and meal delivery.

In January 2018 Amazon opened their first beta "Amazon Go Store" for employees in Seattle. Buyers scan their app on entry, and sensors and cameras detect whatever buyers buy off the shelves. There are no cashiers or checkouts. In November 2018 Amazon announced they would open two more headquarters in Long Island City, New York City, and in Crystal City, Virginia.

Working conditions at fulfillment centers have created a lot of bad press for Amazon. Employees have time quotas at the fulfillment centers that allow barely enough time for an employee to do what they are told. Employees feel like rats on a treadmill. Pay is low, complaints are frequent, and many workers are seasonal. The wage is not a working wage, and many receive food stamps and government assistance. In October 2018 Bezos announced that Amazon would pay \$15 an hour to all US and UK employees. According to a Newsweek article in January 2019, \$15 is total compensation, including cash, stock, and incentive bonuses, and is only paid to full time not temporary employees. Employees have started posting their experiences on YouTube.

Examples: "it's like an all-day workout, no Thanksgiving off, compulsory overtime especially at holiday times, and having to urinate in bottles and trash cans to avoid missing strict time targets". An anonymous worker began writing a column for the UK Guardian newspaper about the toxic working conditions. Amazon has refuted these horror stories calling them myths. Like Apple and Google Amazon have also been criticized for corporate tax avoidance.

Like Google (now Alphabet), Amazon's share price is over \$1,000, too high to be used in DJIA, which uses share price as an input. Both Alphabet and Amazon are traded on the NASDAQ exchange. Bezos says Amazon is not a retailer but a technology company. Certainly Amazon Web Services, initially offering data on Internet traffic patterns, have now expanded to supply services for processing power, and storage. Netflix for example rent Amazon's storage space for their video streaming.

Amazon's market capitalization in 2020 was \$934 billion. In September 2018, it briefly became the second company after Apple to be capitalized at over \$1 trillion. Revenues for 2019 were \$155 billion. Net income was \$7 billion in 2019. In 2018 Amazon employed 566,000 people.

Jeff Bezos' net worth peaked at \$157 billion in January 2019. He divorced his wife Mackenzie in April 2019. In October 2019 Jeff was worth \$113 billion and Mackenzie was worth \$33 billion. He has been vying back and forth with Bill Gates for the title of the world's richest man. Putin could well be wealthier, though his wealth is kept secret. Some historians say Julius Caesar was the richest man of all time whose fortune was about 20% of the Roman Empire's economy, which in today's terms would be around \$5 trillion!

In a Wall Street Journal Editorial on February 14th, 2019 the Editorial board wrote: "After getting mauled by a mob of unions and politicians, Amazon cancelled plans to build a headquarters in New York City". Because some politicians objected to \$3 billion in tax incentives over many years (par for the course to encourage investment), New York City will lose 25,000 jobs and nearly \$200 billion over 25 years. Politicians demanded Amazon unionizes before setting up in New York City. Representative Alexandria Ocasio-Cortez (D-NY) tweeted "Today's the day a group of dedicated everyday New Yorkers and their neighbors defeated Amazon's corporate greed". New York shot itself in the foot. Crystal City, Virginia will benefit instead.

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+7.+5.00 | ABN SECOL. Presumably created in July of 2000, it was printed by the Security-Columbian Banknote Company
(a merger of the Security Bank Note Co. and Columbian Bank Note Co. in 1957, with plants in Philadelphia, Pittsburgh and Chicago,
it is now a division of the US Bank Note Corp). Microsoft's seal shows incorporation in Washington State in 1993.

Bill Gates (1955- ) grew up in Seattle, WA. His father was a prominent lawyer and encouraged him to compete, rewarding him for winning and penalizing him for losing at almost anything. Bill Gates attended Lakeside, a Seattle preparatory school, where he used a Teletype terminal connected to a block of computer time on a GE computer. Gates wrote programs in BASIC on this machine. Later he, Paul Allen, and two other students (all from Lakeside) were banned from using the Computer Center Corporation's (CCC) mini-computer after they were caught exploiting operating system bugs to get free computer time. They offered to find bugs in exchange for computer time, leading Gates to study various programing languages until CCC went out of business in 1970.

Gates' SAT scores were 1590 out of 1600! He went to Harvard in 1973 to study math and computer science, becoming a star undergraduate programmer. At Harvard he met Steve Ballmer, who was later to become Microsoft CEO.





Staff of Microsoft in 1978. Bill Gates bottom left, Paul Allen top right.

In 1975 Paul Allen (1953-2018) showed Bill Gates an issue of Popular Electronics, featuring the Altair 8800, made by Micro Instrumentation and Telemetry Systems (MITS) of Albuquerque, New Mexico. It used an Intel 8080 chip. Gates and Allen thought of using BASIC programing language and converted it for use on the Altair 8800. Gates met with MITS to demonstrate BASIC, which MITS agreed to. (BASIC was the dominant programing language of the late 1970s and early 1980s). Allen left his job at Honeywell, and Gates left Harvard, never to return. They formed Microsoft Corporation to write programs for MITS in 1975.



Altair 8800 microcomputer using Intel 8080 8-bit chip and 8" floppy disc.

Micro-soft was originally hyphenated. It referred to software for microcomputers. The hyphen was soon dropped. Microsoft located in Albuquerque, New Mexico, close to MITS, an electronic kit maker for hobbyists, founded in 1969. They started with calculators and moved into microcomputers. When Intel produced the 8080 chip MITS felt this was powerful enough for a decent microcomputer. MITS negotiated a price of \$75 for the chip, thinking they would sell a few hundred Altair 8800s, but were flabbergasted by the demand for it: they sold 5,000 in seven months! Though the Altair 8800 sold in 1975 for \$439 as a kit, and \$621 assembled, it needed various other components to work properly, bringing the price to well over \$1,000. RAM memory was only 4 kilobytes! Later, other companies made cheaper and more reliable microcomputers with the 8080 chip, displacing MITS.

A pre-market copy of BASIC for the Altair 8800 leaked into the hobby community, depriving Microsoft of royalties. Gates then wrote an open letter to hobbyists in the MITS newsletter saying that pirated programs would eliminate any incentive for professional developers to write quality software. This made Gates very unpopular with hobbyists.

In 1976 Microsoft became independent from MITS. A famous grinning mugshot exists when Gates was arrested for speeding in New Mexico in 1977. Some say he was driving without a license. Gates posted bail immediately and charges were dropped. His father of course was a prominent attorney.



Grinning mugshot of Bill Gates when arrested for speeding in 1977 aged 22.

In 1978 Microsoft sales reached \$1 million. The next year they moved to Bellevue, WA, where Gates and Allen had grown up. For the first five years at Microsoft, Gates personally reviewed every line of code Microsoft published, often re-writing bits of it. In 1980 Microsoft made SoftCard, a plug in coprocessor card to turn the Apple II into a different operating system called CP/M, selling at \$349. This was Microsoft's number one revenue, and sold 5,000 copies.

In 1980 IBM asked Microsoft about an operating system for its new IBM PC. Gates referred them to Digital Research, but talks stalled. Gates then bought an operating system from another company, modified it, and named it MS DOS (Microsoft Disc Operating System), which he sold to IBM in 1981. Microsoft just charged IBM \$50,000, knowing that other vendors would clone the system, which they did. But this was the beginning of Microsoft's influence.

Intel has been an enormously influential company in the computer world. Gordon Moore, Intel's first CEO predicted in a 1965 paper that computer memory would double every two years. It did for the next 50 years, and this has been called Moore's law. Here is a list of some of Intel's chips over time:

4 bit processors: 1971 e.g. for calculators

8 bit processors: 1972 e.g. 8080 in 1974 for Altair 8800

16 bit processors: 1978 e.g. 8086 e.g. IBM PS/2 Model 25 & 30

1979 e.g. 8088 e.g. IBM PC

1982 e.g. 80286 e.g. IBM PC AT

32 bit processors: 1985 e.g. 80386 e.g. OS/2, Mac OS, Linux & Windows,

1989 e.g. 80486 1994 e.g. Pentium 1997 e.g. Pentium II 1999 e.g. Pentium III 2000 e.g. Pentium 4

64 bit processors: 2001 e.g. 1A-64 Itanium, Pentium D.

I recall buying 8086, 80286, 80386, and Pentium chip computers over the years. The 8086 computer never worked until my brother in law visited and disassembled the computer only to find the mains power was not hooked up inside the box to the computer!



Steve Ballmer 2008

Steven Ballmer, who Gates met at Harvard, joined Microsoft in 1980. The same year Microsoft reincorporated in the State of Washington, and Gates became President and Chairman. In 1983 Paul Allen developed Hodgkin's lymphoma, and left Microsoft. He was fortunately cured, and went on to become an influential businessman outside Microsoft. He died in 2018 with a net worth of \$20 billion. Also in 1983, Microsoft developed Microsoft Word, pioneering the acronym WYSIWYG (what you see is what you get). Microsoft made \$55 million in sales in 1983 mainly for over a million MS DOS operating systems installed in PCs. By the 1990s they would sell over 100 million such copies.



Redmond, WA campus, over 8 million square feet, opened 1986

In 1985 Microsoft made their first MS Windows with a graphic user interface (GUI or icons instead of lines of writing), drop down menus, and scroll bars. They had stolen GUI from Apple, who in turn had stolen it from Xerox. The next year Microsoft floated an IPO for \$61 million, and moved their headquarters to Redmond, Washington. The campus is now over 8 million square feet with 30,000-40,000 employees. Microsoft also has campuses in Mountain View, Washington, and Charlotte, North Carolina.

In 1987 Gates became a billionaire, actually the world's youngest self-made billionaire, aged 31. That year Microsoft released OS/2 to original equipment manufacturers (OEMs), and MS Works (a combination of MS Word, MS Excel and MS Access). They were the world's biggest PC software company. In 1989 Gates founded Corbis digital imaging Company. Interestingly, he is colorblind!

But Gates had a poor personal reputation. He would not answer or return telephone calls. He was seen as "distant". Gates' managers said he was verbally combative, and constantly berated people. He would interrupt presentations saying things like: "that's the stupidest thing I've ever heard", and "why don't you just give up..." Gates gradually switched from code writing to management. His last code writing was in 1989.

In 1988 Microsoft persuaded many original equipment manufacturers (OEMs) to install Microsoft software i.e. OEMs paid for Microsoft operating systems even if another operating system was used by the end user. In 1990 the Federal Trade Commission followed Microsoft closely for collusion with IBM. That year Microsoft released Windows 3.0. Microsoft's Windows Office Suite (MS Word and MS Excel) pushed out WordPerfect (a popular word processing program) and Lotus 123 (a popular spreadsheet).

In 1992 Microsoft advertised MS Windows 3.1 on TV. As a result, they sold three million copies in two months. The next year Microsoft announced Windows NT Operating System for business and networks, with a 32 bit not a 16-bit operating system. Apple had sued Microsoft for stealing their GUI, but the courts in 1993 judged in Microsoft's favor. 90% of the world's PCs then used Microsoft's operating systems.

In 1994 Gates, almost 40, met Melinda French, a computer engineer and MBA, who was working at Microsoft. They married in Hawaii. Their 66,000 square foot mansion overlooks Lake Washington near Seattle. That year Gates was elected Distinguished Fellow of the British Computer Society (DFBCS), which has only 20 members. The same year the US Department of Justice was chasing Microsoft. Microsoft had agreed not to bundle a web browser with their Windows operating System. The next year, Microsoft characteristically did just that! Although they released Windows 95 without a web browser, weeks later they came out with a new web browser called Internet Explorer, which they bundled free of charge with their operating system, calling it Windows 95 Plus! They sold 7 million copies in the first five weeks. The US Department of Justice then opened an investigation into Microsoft, and shortly after stopped Microsoft from buying Intuit, a financial software leader.

In 1998 the US and 20 States Attorneys General sued Microsoft for monopolization. To say that Gates was obfuscatory in his depositions is an understatement! Judges were seen laughing at him. Gates' denials and pleas of ignorance were directly refuted by copies of his emails, which the judges had before them. They judged against Microsoft. That year Gates left as President, handing over to Steve Ballmer. The next year Gates would also hand over the CEO position to Ballmer and name himself "Chief Software Architect". He had been Chairman since 1981. In 1999 Gates' wealth briefly reached \$101 billion, though after the dotcom bubble burst, he was worth less, never catching up with that high point.

In 2001 Microsoft settled with the US government, who imposed restrictions on Microsoft's corporate practices. The government labelled Microsoft an "abusive monopoly". Undeterred, Microsoft came out in 2001 with a new gaming box called Xbox, to compete with Sony and Nintendo. They also introduced Windows XP for business and networking (derived from "Windows Experience"). Many business applications were written for it.

In 2004 Microsoft settled again with the US government in another anti-trust suit. The European Union also brought an anti-trust suit against Microsoft

saying it abused its dominance with Windows operating systems. They fined Microsoft \$613 million, requiring them to make windows XP without Window Media Player. The European Union fined the recalcitrant Microsoft another \$1.4 billion two years later for not complying with the 2004 order.

Queen Elizabeth II knighted gates in 2005. Melinda was also made a Dame of the British Empire. In 2016 Bill and Melinda were both given the US Presidential Medal of Freedom, and the French Legion of Honor.

In 2007 Microsoft introduced MS Vista, a new version of Windows operating system. But many users were baffled by the numerous options and balked at the expensive change in the operating system. I recall running a solo medical office then. I had to update billing programs. But not only did I have to pay for the billing program, I also had to pay to update the Microsoft operating system, paying thousands of dollars for multiple operating stations licenses. And this was only because Microsoft refused to support their older operating systems. This left a bad taste in my mouth, encouraging my personal switch to Apple, though my business software required Microsoft operating systems.

In 2008 Microsoft launched cloud computing. However, Microsoft had fallen behind in smart phone operating systems and in 2010 belatedly updated their Windows Phone with the Windows Mobile operating system. In 2011 they launched Outlook.com, an email system to compete with Gmail. The next year they boorishly advertised that Google was screwing customers with search results to promote Google's advertising, and that Gmail violated privacy. Microsoft sold their 50% stake in the left-wing MSNBC, a joint venture with NBC since 1996. That year was Microsoft's first operating loss.

The next year Microsoft lost \$32 billion in market capitalization because of poor software sales. Realizing that their PC business was mature, they sensibly split into four divisions: Operating Systems, Applications, Cloud, and Devices.

Microsoft after 2013 seemed to become more government friendly - the opposite of Google (who have abandoned their artificial intelligence program with the US government, and set up a similar program in China, which could well benefit the Chinese not the US military). Microsoft shared information about its own program bugs with the US government, allowing access to source codes. In 2018 Microsoft partnered with 17 US intelligence agencies to develop software to track US citizens and supplied 100,000 HoloLens headsets to the US Military.

In 2014 John Thompson replaced Gates as Microsoft Chairman, and Satya Nadella replaced Steve Ballmer as CEO. In 2015 Microsoft produced the first interactive whiteboard for use in classrooms, though their world mobile phone operating system market sunk from 7.2% to 2.7%.

Gates became more active in charity, focusing especially on World Health, particularly vaccines, and cheap toilets to stop the spread of disease in the undeveloped world. Additionally, he sensibly supported genetically modified foods to combat starvation and deficiency diseases. After all, what is the point of railing against a perceived "unnaturalness" of genetically modified food, when 13% of the world is starving, and can benefit from higher yield crops?

Gates studied Andrew Carnegie and John D. Rockefeller and donated some of his Microsoft stock in 1994 to create the Bill and Melinda Gates Foundation, which became the world's largest charitable foundation. Bill and Melinda publicly stated they wanted to leave their three children only \$10 million each and to give away the rest to charity. Gates partnered with Warren Buffet pledging to donate at least half of their wealth. Gates now displays an interesting parallel with Andrew Carnegie: once an aggressive, abusive businessman in his accumulative stage; now a mellowing, more thoughtful posture in his charitable stage.



Bill and Melinda Gates in 2009.

In 2019 Microsoft revenues were \$130 billion, net income was \$41 billion. Capitalization was \$1.24 trillion in January 2020. They have 131,000 employees. They joined the DJIA in November 1999 and remain there today.

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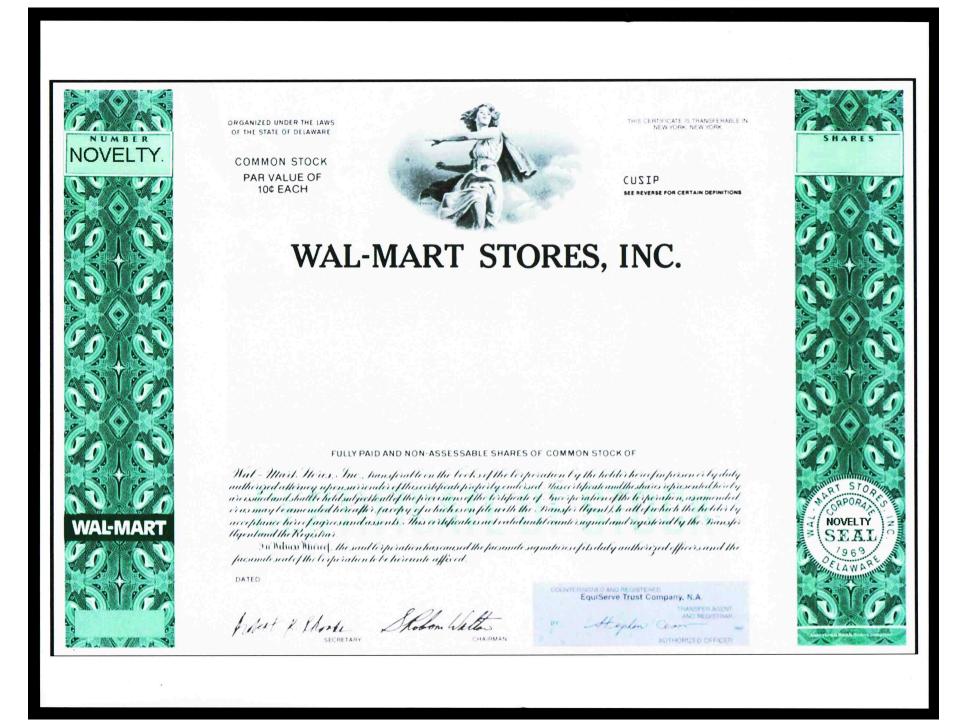
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Walmart may not be so valuable in market capitalization (\$333 billion in 2020) as the preceding companies. Their profits were only \$14 billion in 2019. But their revenue vastly exceeds others, at \$521 billion in 2018, and their workforce vastly exceeds others at 2.2 million worldwide. The closest competitor for workforce size worldwide is Amazon at 575,000.

Before embarking on a history of Walmart, I would like to take a detour into the fascinating history of merchandising in the US. In 1700s and 1800s **itinerant peddlers** sold goods in the country by barter. As roads improved, they could use a horse drawn cart holding more merchandise. They would barter their merchandise, then return to their closest town or city, where they would exchange their bartered goods for more goods and sometimes cash, or country pay. Country pay was barter recorded on a ledger, and was the usual way of doing business in the countryside in America, where access to money was limited.

As villages sprung up, local stores would keep a ledger of goods sold, who they sold them to, and their value. Thus, a farmer might bring in eggs and wheat, for which he was given credit on his account, perhaps to pay off a plow. Real money was always welcome, but often hard to come by. **Country general stores** thus replaced itinerant peddlers. As towns grew larger **specialty stores** like butchers, grocers, and farm implement dealers sprang up. After the Civil War (1861-1865), specialty stores expanded further e.g. clothing, drugs, jewelry and furniture. General stores declined. As the railroads expanded, retailers could bypass wholesalers. **Department stores** and **mail order** started.

Department stores were an experience for the shopper (usually female); they accepted returns and would deliver goods. Macy's in New York City, and Wanamaker in Philadelphia, PA, were the two leaders. **Grocery chain stores** e.g. Great Atlantic and Pacific Tea Co. (later A&P) and Kroger, were the two leaders. For example, A&P started as a tea and coffee store in 1859, growing to 70 stores by 1878, when they converted to being a grocery chain. From 1915 to 1975 it was the largest grocery chain in America until went bankrupt in 2010.

Variety stores, like Woolworths and other nickel and dime stores, were another type of chain store, which sold at discounts. Montgomery Ward, Sear Roebuck, and Spiegel were the three early mail order houses. Mail order was more successful to African Americans and isolated country farmers. Parcels before 1913 were delivered to the closest town large enough to have a private express office like Wells Fargo. Railroads enhanced the ability of outfits like Wells Fargo to transport parcels. Rural postal delivery was made free in the 1890s. In 1913 parcel post started, supporting direct delivery of parcels to rural farms. Then with increasing urbanization mail order companies opened stores in town.

1930 saw the first **grocery supermarket** launched by Michael Cullen in New York City, which emphasized self-service, shopping carts, extended opening hours, large size, and low margins. Grocery chain stores like A&P and Kroger now had to compete with this. Variety stores could still compete because removing the wholesaler middlemen allowed them to keep prices low. During the Second World War (1939-1945) full employment led to increased demand so stores needed less advertising, more evening hours, and less price-cutting.

1948-1962 has been called the "retailing revolution" characterized by:

- More available consumer goods from technological innovation.
- Increased purchasing power of the middle class.
- Willingness to go into debt to buy durable goods the beginning of consumer credit.
- People and shops moving to the suburbs, which were cheaper locations.
- Discount merchandising. Supermarket food discounting came first then hardware. Department stores and small specialty stores were beginning to discount too.
- Longer operating hours.
- Brash advertising.
- Mail order this meant no storefront costs and lower inventory costs.
- Lower margins and gradual dissipation or evasion of State Fair Trade Laws.

From 1900 to 1950 gross margins were about 35%. After 1950 discounting led to gross margins below 30% and often in the teens. State Fair Trade laws were passed in the 1930s to allow manufacturers to set price floors below which an item could not be sold. But beginning in the 1950s these state laws gradually dissipated or were evaded.

By 1960 America had 1,329 discount stores averaging 38,400 square feet with \$1.5 million a year in average sales. By 1969 America had 4,635 discount stores averaging 65,000 square feet with \$50 million a year in average sales. Thus, within the space of a decade the number of stores tripled, their sizes doubled, and average sales increased thirty-fold.



Sam Walton's High School Graduation photo in 1936.

Sam Walton (1918-1992) was born on a farm. His father decided in 1923 that farming was financially too difficult a life, and returned to being a farm loan appraiser, moving through several different cities. Sam went to college at the University of Missouri, in Columbia, MO, to do economics, where he worked as a waiter, lifeguard and newspaper deliveryman to pay his way. He was gregarious, hardworking, a born leader, and well-liked by all at College.

After college he worked as a management trainee at J.C. Penney at \$900 a year in 1940. His trainer manager was Duncan Majors, who got Sam enormously inspired by retailing. In 1942 Sam resigned and worked at a munitions plant near Tulsa, Oklahoma, where he met and married Helen Robson, daughter of a prosperous banker, who also had a business degree.



Helen Walton in later life.

During the Second World War he worked in the US Army Intelligence Corps and left in 1945 as a Captain. He returned to St. Louis, Missouri, to buy a franchised department store with a college roommate. But Helen wanted the small town life, and also wanted Sam to be a sole proprietor. He therefore moved to Newport, Arkansas, in 1945 and bought a Ben Franklin variety store, which was a franchise of Butler Brothers. The store was 5,000 square feet on a corner with \$72,000 in annual sales. Small towns like this typically had several grocers, but only one or two variety stores, which locally had near monopolies.

Further, local businessmen owned most small town main street property, so they were in control of the leases. Opening times were fixed. Merchants also tended to fix prices, though not overtly. Sam often visited his competitor's stores to learn their marketing and pricing methods. He found he could often buy goods

cheaper than Butler Brothers. He also found he could sell more goods if he lowered prices e.g. three for a dollar, rather than 50 cents each. Sam became a civic and church leader. After five years his store was selling \$250,000 a year. But he could not renew his lease, so in 1950 he bought an independent store in Bentonville, AK (population 3,000).

Sam expanded the store, installed fluorescent lights and called it Walton's 5-10 (referring to nickel and dime prices). Again, he became a church and civic leader as he had been in Newport. He then opened a second store in Fayetteville, with the same name.

He hired managers from other stores offering them a percentage of the profits. He was an early converter to self-service, which saved on store clerk salaries. Additionally, he found sales were greater in self-service stores. He also learnt about endcaps for promotional merchandise (endcaps are at each end of an aisle). But unfortunately he was still bound by his Butler Brothers franchise agreement to buy 80% of his merchandise from them.



Walton's 5-10 store in Bentonville, now Walmart Visitors Center.

Sam was a driving personality and wanted to open yet another store in a Kansas City suburb, so asked his brother, Bud (who also ran another Ben Franklin store), to partner with him. Because travelling long distances took such a long time in his car, he bought a plane and learnt to fly. He could then travel regularly more quickly between his stores which were expanding rapidly. Another idea he put into practice was to have his managers psychologically invested in their stores, by having them invest financially in them, as well as other stores.

By 1962 he owned 16 franchised stores and bought a 20,000 square feet store in St. Robert, MO, a town of only 2,000. Interestingly, he found it attracted shoppers from a distance and sold \$2 million a year. Sam continued regular visits of all his stores and other discount stores. He also visited "closed door" stores. These were discounters that required you to be a member to gain entry. This avoided fair trade laws, advertising costs, décor costs, and the rent was low because they were "the wrong side of the tracks". Volume was bigger, but margins were only around 13%. Often they sold to small businesses like restaurants, so specialized in particular types of merchandise, e.g. little in the way of clothing, and a lot of bulk goods.

Sam began to realize that discount stores did better in small towns than large cities, because real estate was cheaper, the public was willing to travel to you, and if the store was large enough competitors would not move in. Sam tried to persuade the franchiser executives to locate large discount stores in small towns. But they were not interested. So Sam spoke to Henry Gibson, a huge discount store chain owner, who snubbed and rejected Sam. No one was interested.

So Sam mortgaged everything he owned and opened a 16,000 square feet Wal-Mart Discount City Store in Rogers, AK in 1962. The store had 22 departments, using mainly tables for display and had three checkouts. Great emphasis was placed on health and beauty aids using them as a "loss-leader" (items sold at a loss or low profit to attract customers into the store). Manufacturers at first refused to do business with him so he had to buy from wholesalers. Kmart and Target had the same idea and were competitors.



First Wal-Mart Discount City store in Rogers, AK 1962.

Sam gradually opened more leased stores in Arkansas, all in communities with less than 25,000 population, and averaging 30,000 square feet. He insisted on never marking up an item more than 30%. As distributors would not supply his remote area, he built his own distribution facility of 72,000 square feet in Bentonville with a rail siding. By 1969 revenues were \$21 million with a net income of \$600,000 a year. Sam knew that to continue expanding, as he wanted, he had to go public, and incorporated in 1969 as Wal-Mart Inc. Sam

became Chairman and President, and his brother Bud became Senior Vice President. The IPO as Wal-Mart Stores Inc. realized \$4.6 million with the family retaining 69% of the ownership.

Even then, some business experts had no idea what was going on and called them "couturier to the hillbillies"! Walmart found it best to buy the land, sell the constructed building to investors and lease it back. This was faster and cheaper than using a developer, who wanted more of a cut. And it freed up more cash for further expansion. Sam gradually closed his Ben Franklin variety stores, selling the last one in 1978.

In 1969 Walmart leased an IBM 360 computer for inventory control at the Bentonville distribution center. Every store had an electronic cash register, which told the computer immediately which item of inventory (or SKU - stock keeping unit) had sold. Computers became integral to their business model, giving them immediate access to information. He insisted all store managers get the information. In 1979 they built a 16,000 square feet computer center in Bentonville.

Sam pushed expansion, low margins, cost cutting and work force loyalty. The customer was always number one in every equation. Walmart buyers could not accept fee meals or gifts from vendors, and demanded that vendors come to Bentonville where their executives were "hard as nails" to negotiate with. The larger Walmart got the less manufacturers could ignore them. Walmart would refuse to see manufacturers' representatives and would only order direct from a manufacturer, demanding they cut 2-6% off prices to reflect the cost of the manufacturers' representatives. If a company refused Walmart would order elsewhere.

From Monday to Thursday Bentonville executives flew around to all the Walmart stores interviewing clerks (whom they called "associates"), department managers and store managers. They also visited other discount stores. On Fridays they would collate their information in Bentonville, ready for presentations on Saturday mornings with Sam. These meeting were broadcast to every store, and seen by the store managers and department heads. The work was grueling. A distribution center could handle about a 400-mile radius of stores, so when Walmart was expanding in other territories, people knew by the distribution center location where they were going.

The country boy, folksy atmosphere prevailed. Sam would make surprise store visits and pay close attention to associates. One associate suggested greeters in every store. This became a trademark, and a potent employment opportunity for the disabled and elderly. Sam promoted esprit de corps with a monthly employee magazine, annual picnics and store visits. Although associates were poorly paid, department heads and managers were well paid with profit sharing, and life and health insurance. Any Walmart employee could participate in a voluntary stock purchase, and Walmart would pay a percentage. Training programs allowed people to advance. These options helped to stave off unions.

They reduced shrinkage (shoplifting, theft, damage, and loss of goods) from an average of 2.2% to 1.4% in 1984 by giving associates half the savings in a program called "shrink the shrink".

In 1981 Walmart bought out Kuhn's Big K stores at a bargain basement price adding 92 stores. Other discount giants like Kmart, and Woolco were hurting badly from the early 1980s recession (when there was high inflation and the Savings and Loan crisis). These companies did not perform nearly so well.

In 1984, aged 56, Sam retired, putting Ron Mayer in charge. But Mayer loved corporate cliques. But Sam kept his finger on the pulse and returned two years later. Mayer and about a third of senior executives left. The new staff was better - Walton had a talent for choosing the right people. He stressed energy, loyalty and determination.

Walmart was an early and heavy adopter of information technology. Their huge computer in Bentonville was linked in 1981 to barcode scanning of UPCs (Uniform Product Codes) in their stores. This simplified reordering, stocking, and supply from their warehouse, which was all done electronically, directing the flow of goods directly from the manufacturers. Indeed, manufacturers knew exactly how many items Walmart sold each day so they themselves could plan on production and delivery. This was called electronic data interchange (EDI). In 1987 Walmart launched their own satellite communications network at a cost of \$24 million (then the largest private network in the US), to facilitate EDI. Walmart was half folksy, and half high tech – actually a great combination.

Walmart lacked groceries, pharmacies and arts and crafts, but Sam wanted everything. He duly opened 14 "Dot Discount Drug" stores, and three Helen's Arts and Craft stores. None made enough profit and he sold them all.

In 1980s he got into deep discounting with Sam's Club. These were called "closed door" stores. Stores were located in inexpensive areas in large cities rather than small towns so they did not compete with Walmart. Maximal margin was 18% not 30%. Customers, who were usually small businesses, bought in higher volume. You could sell \$60 of goods at Walmart with 25% margin and make \$15, or you could sell \$300 of goods at Sam's Club with 12% margin and make \$36.

A common metric for retailers is sales per square foot of floor space. Walmart has always been considerably ahead of its competition. Another metric is "inventory turns" or turnover per year. Walmart outperformed others on this metric too. Sam's Club Warehouses sold \$600 per square foot per year, about three times that of Walmart. Gross margin was 10-13%. Inventory turns per year were 17 at Sam's Club and five at Walmart.

After the success of Sam's Clubs, Sam turned his attention to grocery supermarkets linked to his Walmart hardware stores. Hypermarkets had been tried before in the 1970s but failed. Sam wanted to try it again. A typical

hypermarket was 200,000 to 300,000 square feet. Sam's first hypermarket was 220,000 square feet in a Dallas suburb in 1987 (though the store itself was only 150,000 square feet, the remainder being for banks, fast food outlets etc.) He called them, "malls without walls". Walmart tried four hypermarkets. But profits were poor. They closed in 1990, mainly because the customers just found them too big to get around.

Instead Walmart tried a new concept – supercenters of around 125,000 to 150,000 square feet in small towns with margins of 17% – 18%. They stocked around 100,000 SKUs (stock keeping units).

In 1988 Sam retired for good at the age of 70, handing over to David Glass. In 1990 Sam developed multiple myeloma, a cancer of the bone marrow, and died in 1992. When he died, he left his wife, Helen, \$24 billion, making her the richest person in the world second only the Sultan of Brunei.

In 1990 Walmart overtook Kmart and Sears in revenues. In 1991 they expanded abroad, first to Mexico, then to Canada, South America, China, Europe and India. The government bureaucracy was so bad in England that it would have taken many years just to get a store built and get through all the town council bureaucracies. So instead they bought out another English chain, ASDA.

In 1998 Walmart started their fourth type of store the Neighborhood Markets. These were food only supermarkets of around 40,000 square feet. They now have four operating divisions:

- 1. Walmart US (Walmarts, Supercenters, and Neigborhood Markets)
- 2. Sam's Clubs
- 3. Walmart Internet
- 4. Global eCommerce

The average Walmart is 100,000 square feet selling hardware.

The average Supercenter is 180,000 square feet selling hardware and groceries, The average Neighborhood Market is 40,000 square feet selling groceries.

In 2006 Walmart launched \$4 per prescription generics (from India) and gave the formulary to local physicians. I was one of the physicians that received this formulary. It struck me at the time that Walmart had made a giant leap towards helping society with cheaper formulary costs. Shortly after, other pharmacies copied Walmart. The problem was that if you had insurance with a \$30 prescription copay you had to pay \$30 not \$4 for the same drug, unless you pretended you did not have insurance.

Walmart is trying to compete with Amazon.com but does not have first mover advantage. Walmart's first website was surprisingly old fashioned and they are now playing catch up. They seem to have less variety than Amazon. For example, I searched for a parabolic mirror. Amazon showed 10 on their first page. Walmart gave none, but instead gave 18 posters showing parabolic satellite dishes! Walmart has 70 million SKUs; Amazon has 564 million!

The press has focused on the negatives of Walmart. Sam Walton was not a big donor to charity himself. He encouraged local Walmarts to donate small amounts to charity. Walmart granted a limited number of scholarships. This was good for business, but each donation seldom exceeded a few thousand dollars. Instead, Sam said he did great good to Americans by discounting their goods, thus raising their standard of living; and this is true. Walmart took advantage of a great public relations opportunity with Hurricane Katrina in 2005. Walmart and Home Depot both gave free supplies to victims. Walmart contributed 2,450 truckloads of goods worth \$18 million.

When Walmart locates in a small town, they often drive out small main street businesses. However, discount stores are part of evolution. Customers have voted with their feet. They prefer lower prices and more convenience. The price to pay was losing their main street, and its multiple store owners. The same sort of thing has happened in the past with railroads, urbanization, and recently with shops moving from towns to strip malls in the suburbs.

Prof. Ken Stone, Professor of Economics at Iowa State University, studied this in 1989. He found that when a Walmart moves to town, total retail sales increased by around 8% after four years in towns with a population over 30,000, and 3% a year in towns with a population under 30,000. Most of the increases go to Walmart. Some small towns lost up to 50% of their retail trade over 10 years. However, local businesses can still compete with restaurants, personal delivery, special ordering, services and so forth. Other studies have shown than when Walmart comes to small communities, they can stop their decline, and the average per capita income increases.

Another perceived negative has been low salaries for associates. Average associate pay in 2020 was \$24,000 a year including extras. Department managers averaged \$35,000 a year including extras. The average Walmart manager in 2020 makes \$175,000 a year including extras. Walmart, like many other employers have been careful to exclude unions. In 2013 the National Labor Relations Board found Walmart had illegally disciplined employees who went on strike. 70% of employees leave within their first year. Walmart hires disproportionately more African Americans and women. On the other hand, Walmart leads as America's biggest employer, employing 1.5 million in the US and 2.2 million worldwide. The next largest private employer is Amazon with only 575,000 employees around the world in 2018. Amazon has also been criticized for many years for its similarly low wages, though has recently promised a wage of at least \$15 for full-time employees including benefits.

Another perceived negative has been the problem of buying from abroad, especially China. In 1985 Sam sent an open letter to 3,000 US manufacturers inviting them to participate in a "Buy American" program. Although there are plenty of Chinese goods in Walmarts, they love to display the American flags. However, Sam would not pay higher prices. The fact of the matter is that goods manufactured in America are usually just too expensive to compete.

In 2005 Walmart announced environmental measures and embraced recyclability. They vowed to increase efficiency of trucks, and decrease energy used by stores, and to decrease solid waste. They also installed large numbers of photovoltaic cells on their roofs.

Theft from Walmart stores can create a burden on local police. Walmart have responded by spot-checking receipts at exits, private security, and security cameras. They also introduced a program where first time offenders who steal items under a certain value can avoid arrest if they agree to go through a theft prevention program, for which they have to pay \$400. However, the US courts have pushed Walmart to stop this, calling it "extortion". Cases will now have to go through the courts, which will now cost the taxpayer \$300 – \$600 per case.

After Sam died the Wal-Mart trademark changed to Wal\*Mart. Recently they have changed to Walmart with the spark symbol of 6 radiating stripes, apparently in homage to their associates. Walmart now own 11,718 stores worldwide.



Note old trademark left with star, and new trademark right with spark symbol.

Sam's formula has been half folksy and half high tech, with EDI and sophisticated inventory control, relentless cost cutting, cutting out middlemen, pressuring manufacturers to cut prices, consumer satisfaction, ability to pick good staff, relentless expansion, and locating large stores in small towns.

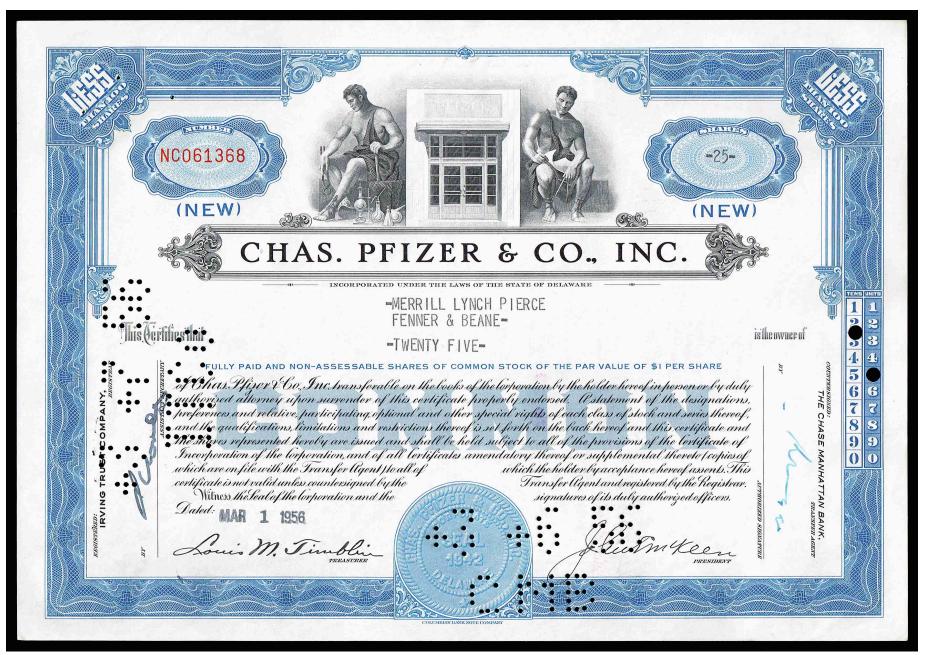
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By User Bobak on en.wikipedia - \* 18:46, 6 September 2006 [[:en:User:Bobak|Bobak]] 800×600 (140,333 bytes) <span class="comment">(:= Summary == [[:en:Sam Walton]]'s original Walton's Five and Dime, now the [[:en:Wal-Mart]]] Visitor's Center, [[:en:Bentonville, Arkansas]]]. Photo taken by [[:en:Bobak Ha'Eri]]. September 2, 2006. Please observe license and properly cite in use outside Wiky
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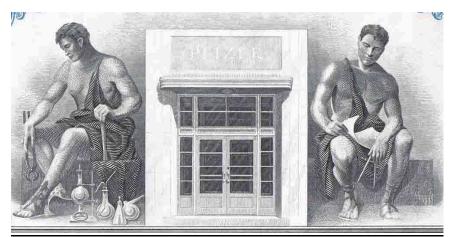


8. Pfizer Stock Certificate for 25 shares of common stock to Merrill Lynch dated March 1956.

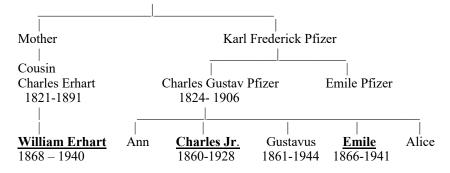
Pin punch cancelled +3 +7 56 | I T Co, and +3 +6 56 | C M B: Chas Pfizer was the precursor of Pfizer.

Company #6 was Exxon Mobil, the successor to Standard Oil, which has already been dealt with.

Company #7 is A T & T, which has also already been dealt with.



Vignette, showing building with Pfizer above entry. Left figure is allegory of chemistry. Right figure is architecture? signifying designing drugs!

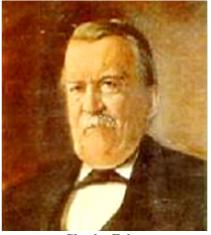


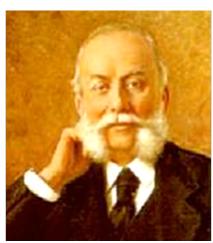
Pfizer Family Tree. 3 inheritors of Pfizer business in 1900 underlined & bold

Charles (Karl in German) Pfizer was born in 1824 in Wurttemberg. Formerly the Duchy of Swabia, it became the Kingdom of Wurttemberg in 1805, then part of Germany in 1918. The largest town was Stuttgart. Charles, a chemist, immigrated to the United States in 1848 at the age of 24. His cousin, Charles Erhart, was a confectioner. In 1849 they partnered to manufacture santomin in a toffee, borrowing \$2,500 from Charles Pfizer's father. They located in Brooklyn, New York.

Santorin (trade name Santomin) is a toxic chemical that paralyses intestinal worms, allowing them to pass. This was a common American problem in the mid 1800s. Santomin was originally isolated from the flowers of the Artemisia genus of plants, found in Russia and central Asia. The drug fell out of favor when new, less toxic drugs, like piperazine appeared in the 1950s. Approximately two billion people around the world still harbor parasitic worms. Pets often have other sorts of worms too

During the Civil War (1861-1865) there was rising demand for disinfectants like potassium iodide, potassium permanganate, liquid iodine, creosote, and alcohol. At the time Pfizer was primarily a chemical company. They also made tartaric acid, which soldiers used as a laxative and a diuretic (to make more urine).





Charles Erhart

**Charles Pfizer** 

In 1869 Pfizer moved to a larger building at 81 Maiden Lane, Manhattan with 150 employees. In 1880 Pfizer started producing citric acid for use in soft drinks. In 1891 Charles Pfizer's cousin and partner, Charles Erhart, died. They had agreed that if one of them died the other could buy him out. Pfizer paid \$119,350 for Erhart's share of the privately held company.

In 1900 Charles Pfizer retired and distributed one third of the company to Erhart's son, William; and one third each to his own two sons Charles Jr., and Emile. Charles Pfizer Jr. took over as President until 1906, and then Emile took over from 1906 until he died in 1941. Charles Gustav Pfizer, the father, died in 1906 soon after fracturing his arm from falling down stairs at his summer home in Newport, Rhode Island.

During a citric acid shortage in 1919, Pfizer chemists learned of a fungus that formed citric acid from sugar, which helped its production. Later, this industrial production experience would be very helpful in making penicillin.

Alexander Fleming discovered penicillin in 1928 when he noted that bacterial growth on an agar plate was inhibited by the penicillium mold. They had grown because he had left the plates to incubate too long. Howard Florey and Ernst Chain did clinical trials on it in 1941 at the Radcliffe infirmary, Oxford, England (where I trained). They also discovered penicillin's formula, and how to manufacture it. It is estimated that penicillin has saved 200 million lives. Pfizer produced enormous amounts of penicillin during the Second World War (1939-1945). During all of this, in 1942, Pfizer went public.

In 1936 Pfizer pioneered the production of vitamins. In 1950 they discovered the antibiotic, oxytetracycline and started a pharmaceutical sales force to inform physicians. Pfizer then switched from being a chemical company, to a research-based pharmaceutical company. In the 1950s they expanded to Europe, Brazil, Canada, Cuba and Mexico. In 1959 they started an animal health division.

In 1967 Pfizer invented the antibiotic, Doxycycline. Then followed a long list of drugs that you may or may not have heard of including: Minipress, Procardia, Feldene, Zoloft, Lipitor, Norvasc, Zithromax, Aricept, Diflucan, Viagra, Flagyl, Lyrica, and Celebrex. Many of these earnt Pfizer billions of dollars.

Pfizer has been a very aggressive company. They acquired Warner-Lambert in 2000, then Pharmacia and Wyeth. In addition, they acquired a slew of drug companies, that even as a physician, I have never heard of.

In 2009 Pfizer paid a \$2.3 billion fine to settle criminal and civil allegations that it had marketed the drugs Bextra, Geodon, Zyvox and especially Lyrica, for non-FDA approved uses. At the time, this was the largest company fine in history by the federal government. It followed a similar fine of \$430 million for marketing Neurontin, a Warner-Lambert product, also for non-FDA approved indications. Pfizer have thus been serial abusers of illegal pharmaceutical marketing. That is not to say that both Neurontin and Lyrica were not great drugs for nerve induced pain. They were. But the FDA had only licensed them for epilepsy.

Pharmaceuticals are a complex business. You need a boatload of experts in all sorts of things. You need a boatload of money for when things do not go well. And you need luck to discover a blockbuster drug. Every FDA-approved drug that comes to market costs about \$1 billion in development costs. That pays for the 999 out of 1,000 compounds that never make it to market, as well as the phase I, II, and III trials and voluminous FDA-required paperwork. That means that orphan drugs (used for rare conditions), and drugs used briefly (like a week of antibiotics) will likely never make \$1 billion profits, they will not develop.

The process starts with pharmacognostics i.e. finding a pharmacologically active substance with a specific use. Pharmacognosticians often look at plant extracts, known pharmaceuticals, the three-dimensional shapes of known drugs, body neurotransmitters, hormones etc. and try to copy them. These compounds are created chemically by sophisticated processes and passed onto pharmacologists who experiment in test tubes (in vitro) or in laboratory animals (in vivo) to see what effects they have, and whether they might be worth pursuing. These are called pre-clinical studies.

When human experimentation starts, the whole process must be reported to the FDA, and at some time the compound needs to be patented. Drug patents last 20 years, and if the pipeline takes another eight years to complete, the company will only have 12 years to make money on the drug before others are allowed to copy it as a generic. The whole pipeline takes 8-12 years.

Phase I testing uses 20-100 healthy volunteers to gauge effects, to find doses, to find side effects, to do absorption studies, to find out how the drug is metabolized, and to determine its half-life. About one half of the compounds make it out of phase one studies. If so - bushels of FDA paperwork.

Phase II testing uses 100 to 500 healthy volunteers for more detailed studies, especially efficacy. About one third of compounds make it out of this phase. If so – more bushels of FDA paperwork.

Phase III testing is the same except it uses 500 to 5,000 people in double blinded clinical trials and sophisticated statistical analysis. About one third of compounds make it out of this stage. If so - again, more bushels of FDA paperwork. Then the drug is registered and marketed.

Phase IV testing is post-marketing surveillance, giving the company a chance to see the effects on perhaps millions of people. This is when rare side effects can show up.

One very promising drug for Pfizer was torcetrapib. This increased HDL (i.e. good cholesterol). It was used in combination with Lipitor (which reduced LDL or bad cholesterol). Phase III trials on 15,000 patients showed a higher mortality in patients being treated with the drug despite its amazing effect on HDL cholesterol levels. They had to abandon the drug. It had cost Pfizer \$1 billion.

As a physician, I have to comment on my experience with pharmaceutical representatives (also called drug reps). They certainly brought us information and supplied samples. But, once you gave them an opening in the office it was often difficult to shake them off, so I seldom saw drug reps in the office. I tried to stick to generics, to save patients money, using tried and tested drugs. However, drug reps did organize get-togethers with peers in expensive restaurants. I frankly enjoyed the camaraderie, the expensive restaurants, and the educational aspects of the meetings. But it was not to last. Before the US government did it, Big Pharm sensibly came out with their own rules for entertaining. In 2009 they placed caps on food expenditure, and said that the meetings had to be structured with specific educational inputs and goals. A cardinal rule of getting physicians together has always been: Give them food!

For 2018 Pfizer expects revenues of \$53 to \$55 billion, and a profit of \$12 billion. Their capitalization is \$250 billion. In 2016 they employed 96,500 people. It is the largest research-based pharmaceutical company in the world.

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10. Facebook. They never issued stock certificates, but this is a picture of the US Securities and Exchange Commission's "Form of Registrant's Class B Certificates". A similar certificate is available from giveashare.com, a site that issues single shares to frame or as a gift. Nevertheless, even they acknowledge this is a replica, not a real certificate.

Company #9 was GM, which I have already dealt with.

Mark Zuckerberg's father taught Mark BASIC computer programming as a child. When he was 11 Mark became so proficient at programming that his father hired a software developer to train him, who called Mark a "prodigy". Zuckerberg or "Zuck" as he is often called, went to Phillips Exeter Academy, a private boarding school in New Hampshire. While still in school AOL and Microsoft, having seen his artificial intelligence program called Synapse (to learn people's musical tastes), approached him to hire him out of school.



Mark Zuckerberg in 2018.

In 2002 Zuckerberg entered Harvard to major in psychology – though he took copious computer classes on the side. In 2003 he made a computer program called Facemash, which let Harvard students judge women's attractiveness as a "hot or not" game. The Harvard administration closed the site down within two

days after he put 22,000 photos on the site without permission. Zuckerberg was threatened with expulsion. In February of 2004 Zuckerberg, with Dustin Moskovitz, Chris Hughes and Eduardo Severin (all Harvard dorm mates), started a site called Thefacebook for Harvard students. One half of all Harvard students at the time signed up! The site was named after university directory books which showed a photo of each student, with basic information below.

Three Harvard seniors, Tyler and Cameron Winklevoss, and Divya Narendra, had already started a social media site called ConnectU, and had asked Zuckerberg to help them build their site. Instead, they said, Zuckerberg stole the concept and their source code. The three sued him, settling in 2008 for \$20 million cash and \$45 million in Facebook stock. Zuck simply denied everything. A film was made about it called The Social Network in 2010, which does not flatter Zuck.

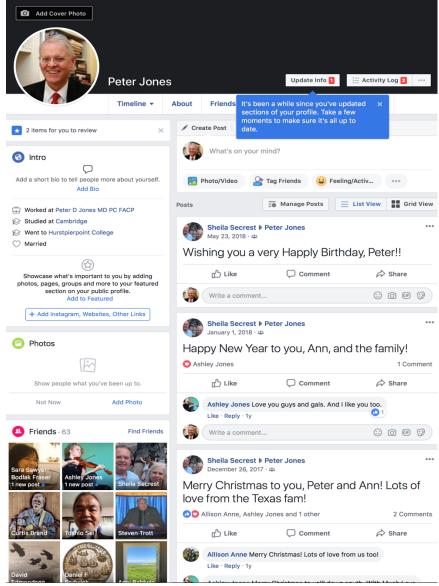
Thefacebook incorporated as an LLC in Florida in summer 2004. By the end of the year any Canadian or American University student could sign up. Zuckerberg was not the first kid on the block - other social media sites were already established at that time like MySpace, which was the largest social networking site in the world from 2005 to 2009. Critics said MySpace did not evolve enough. Napster co-founder Sean Parker said MySpace was, "basically (a) junk heap of bad design that persisted for many, many years".

Facebook then moved to Palo Alto, CA. Peter Thiel (PayPal co-founder) invested \$500,000 for a 10.2% share in Thefacebook. Next year a venture capital firm in Palo Alto, Accel, invested \$12.7 million. Thefacebook became Facebook in 2005. The same year they allowed high school students and Microsoft and Apple employees to use the site. Zuckerberg then formally announced that he would not return to Harvard.

In 2005 Facebook introduced tagging of people in pictures. Later that year they admitted high school and university students in England, New Zealand, Australia and Mexico.

In 2006 Yahoo started negotiations with Facebook to acquire them for \$1 billion. By September of that year the platform was made available for everyone over the age of 13 who had an email address. All users had to reveal their real name. No pseudonyms were allowed. Facebook also made an application programming interface for software developers. At this early stage there was an outcry from Facebook users about privacy. Facebook faithfully promised they would institute privacy controls.

By May of 2007 Facebook opened Marketplace, allowing users to post classifieds and sell products. Facebook added Application Developer to allow outsiders to make their own apps integrating with Facebook. Facebook then launched Pages for Businesses. By October of that year Microsoft bought a 1.6% share for \$240 million.



My Facebook page. I have been inactive for over a decade, but posts still appear.

In 2008 Facebook launched Facebook Chat, People You May Know, Facebook Wall and Facebook Connect. That same year they hired Sheryl Sandberg as COO. By the end of 2008 Facebook had 350 million users. That year, like Amazon and Apple, they located in Dublin, Ireland, where corporate taxes were 12.5% rather that America's 35%. With his knowledge of psychology and programming, Zuckerberg's Facebook was immensely superior to other social networking programs.

Facebook has Timeline on each user's profile page where they can post messages, photos and videos. StatusUser alerts friends to their location or situation. NewsFeed tells users about changes to their friends' profile pages and status.

Facebook began as a political tool in 2008 when over 1,000 Facebook groups pushed users to Obama or to McCain. In June 2009 Facebook launched a game called Farmville on Facebook. For the first time that year they had a positive cash flow from advertising. Facebook also bought the social media real-time news aggregator "FriendFeed". In 2009 they moved their headquarters to Menlo Park, CA. In 2010 Facebook added Facebook Messenger.

In 2012 Facebook bought Instagram for \$1 billion. Facebook announced their own IPO that year. Just before the IPO, Yahoo sued Facebook for infringing ten patents, advertising problems, and social network and privacy controls.

IPO underwriters valued Facebook for \$104 billion, and raised \$16 billion for their IPO, the largest ever for an IPO to date. But the IPO was a fiasco. Subsequently Facebook's stock market value dropped \$40 billion. Forty entities filed lawsuits. Underwriters, Morgan Stanley, JP Morgan, and Goldman Sachs may have acted inappropriately and were investigated by FINRA. But Facebook marched on; by October that year they reached one billion users.

In 2014 Facebook bought WhatsApp for \$19 billion, the most ever paid for a venture capital backed start up. Facebook also bought Oculus VR (a virtual reality company).

Being open to everyone led to hate speech. Facebook admitted in 2013 that their model was not working. In 2014 Facebook experimented on users choosing to show specific content to influence mood. When this was revealed to the public, Facebook responded by saying they would change how they experimented, but they did not apologize. Facebook's fine print states: "Facebook also collects information about you from other sources such as newspapers and instant messaging". Further, Facebook says: "we may share your information with third parties". Facebook said third parties have accessed the majority of their information, and that Facebook scans messages and keeps the data forever. This makes Facebook sound like more of a data mining company for its business potential.

In 2017 Facebook introduced Workplace, an internal platform for companies. There are over 40 million small business pages on Facebook. In 2017 it launched Facebook Journalism Project and also Facebook Spaces, that used their virtual reality application to hang out with friends. By the end of 2017 their profits were \$16 billion.

Despite the rapid rise of Facebook and its capitalization of \$622 billion in 2020, Facebook has huge problems. The principal problems are fake news, privacy

concerns, harassment and abuse. Facebook keeps saying they will fix the problems but the problems never seem fixed. The scandalous saga of Cambridge Analytica, and the 2016 Russian interference with the presidential election using Facebook illustrate all this.

Fake news was flooding Facebook often written by sites trying to steer users for political or business reasons long before the term "fake news" was used. Facebook swept the issue under the carpet. In 2015 they finally said users could flag articles as "false news stories". But this did not work. Then Facebook said users could post reactions to articles. The Pew Research Center said that 63% of Americans on Facebook and Twitter, got their news exclusively from Facebook. In 2015 Facebook declared that posts from friends and family would take precedence over news. Then Facebook said they would judge which news stories were "more informative" and show these to users only if they felt the story aligned with their interests.

By September 2015 Facebook was forced to apologize for publishing their own fake news of video viewing metrics, which, it turned out, were wrong. Facebook vowed they would work more assiduously to prevent fake news.

The 2012 GOP candidate Mitt Romney lost to Barack Obama. Republican experts said it was because Obama used superior social media tools. In the 2016 election Republicans vowed to use those very tools. Facebook accepted \$100,000 for fake news advertising from Putin's puppet the "Internet Research Agency" (IRA). IRA, posing as Americans, planted false Facebook identities, trying to influence the elections by using fake news.

The term "fake news" itself became news during the presidential elections of 2016. Although Special Counsel Mueller investigated whether Trump was complicit with Russian interference in the 2016 presidential election, Facebook was in the limelight almost as much as Trump.

Cambridge Analytica (CA) was owned by a parent company, Strategic Communication Laboratories (SCL), a behavioral research consultancy in England that did data mining and analysis. It was founded in 1990 by Stephen Bannon and Robert Mercer (a billionaire computer scientist, whose daughter, Rebekah, donates to Republican causes). Robert Mercer also developed early artificial intelligence and was a co-CEO of Renaissance Technologies, a hedge fund. CA and SCL folded in May 2018.

In 2013 David Stillwell put a quiz on Facebook called myPersonality. It involved what he called OCEAN, which stood for Openness, Conscientiousness, Extroversion, Agreeableness, and Neuroticism. Millions took the quiz and Stillwell, based at Cambridge University, England, accumulated Facebook data on four million people. He wrote a paper in 2013 mentioning the commercial applications. Christopher Wylie, a CA employee and later whistleblower, approached Stillwell. Stillwell was not interested, but CA hired a Russian psychology professor, Aleksandr Kogan. Kogan then did a Facebook quiz entitled "this is your digital life", a personality inventory on 270,000 Facebook users.

Wylie later claimed Kogan got 50 million profiles which he passed to CA's parent organization SCL, who used Alexander Nix (CEO of CA) to pitch "behavioral micro-targeting". Facebook let CA mine its clients for a fee.



Steve Bannon in 2018.



Alexander Nix in 2017.

Nix was a polo playing Eton graduate, who claimed that through psychological profiling CA could target people directly for political persuasion. He embedded 12 employees in Houston with Ted Cruz to show how to do it – only for Cruz to find out, in 2015, that the software CA touted, called Ripon, (sounds ominously like rip-off!) did not even exist at the time.

England's Channel 4 TV then aired videos made by an undercover reporter who posed as a potential client of Nix and other CA executives. During the video CA explained how they could "covertly" inject propaganda into the internet. SCL then suspended Nix as CA CEO.

How much of CA's psychobabble could really influence voters is difficult to say because CA pulled the wool over politicians' eyes, and indeed perhaps even over Mercer's eyes. Mercer founded SCL with Bannon. Some of it could have been scientific psycho-profiling and Facebook manipulation to gullible, changeable voters. But this has not been subjected to rigorous analysis. In any case CA and SCL are now defunct. True, psychobabble was skillful enough to take in high level politicians like Cruz and Trump, but exactly how much they influenced elections – who knows?

According to Mother Jones, multiple Republican sources familiar with CA said their role in Trump's win was at best minor. Nix's push also included simple policy, like pushing the Hillary Email scandal. Nix also met with Julian Assange, the head of WikiLeaks, who said he had copies of secret emails of Hillary Clinton's campaign, hoping also to use these for Trump's benefit.

Interestingly CA had previously ruled out political work on the home front in England, vowing only to use it abroad. But they changed their tune and worked for Leave.EU, an organization who wanted Brexit. Grilled by a British Parliamentary Committee, Nix denied using Facebook data, denied any association with Russia, and said CA had simply been "a slightly overzealous public relations consultant". Nix had recruited Prof. Kogan from St. Petersburg University, and had made a presentation to the Moscow oil company Lukoil, that had links to the Kremlin.

In September of 2017 Facebook said they would give the US Congress advertisements relative to Russian interference with the 2016 election (through Russia's agency Internet Research Agency). Next month they revealed in a blog that posts were seen by 10 million people. That month sexual assault allegations against Harvey Weinstein and the #MeToo movement spread on the internet. A survey revealed 57% of women had been abused or harassed on Facebook.

In 2011 Facebook had agreed to a consent decree with the Federal Trade Commission (FTC) because they deceived consumers about privacy. As a consequence of this, in 2018, the FTC looked into CA and Facebook and their misuse of data from up to 87 million users because it required that Facebook give users "clear and prominent notice" and get consent before sharing private data.

The FTC would have to go through the Department of Justice to pursue a civil penalty. But in the greater scheme of things, the DOJ likely would not fine them enough to put them out of business, just enough to send a message.

In April 2018 the US Congress called Zuckerberg to testify. He said "it's clear now we didn't do enough to prevent these tools from being used for harm as well.... And that goes for fake news, for foreign interference in elections, and hate speech, as well as developers and data privacy. It was my mistake, and I'm sorry". He said he would increase the number of employees checking for problems, but how can 10,000 employees make any dent on billions of users. In reality he did nothing – not much different from Bill Gates' obfuscations!

Another interesting spinoff of the testimony was that many of the senators were in their 70s and 80s. Younger observers commented Zuckerberg's exchanges reminded them of helping their grandparents with their computers. For example, Sen. Orrin Hatch (R-UT) asked, "how do you sustain a business model in which users don't pay for your service?" Zuckerberg replied, "Senator, we run ads!" Significantly, in July 2018 Facebook did suspend Alex Jones, a conspiracy theorist active on Facebook.

In September 2018 50 million Facebook users were hacked. Sheryl Sandberg went before Congress again about hate speech, privacy, and abuse. She said Facebook was "too slow to act in preventing misuse.... that is on us".

The pattern seems perfectly obvious. Facebook is making a fortune, anything they can do to delay any governmental action will increase that fortune. Delaying tactics, apologies, obfuscation, or whatever it takes, is what they will do. They are only interested in data mining from their social media platform to earn money. Their market capitalization in January 2020 was \$622 billion. In 2019 their net income was \$22 billion, a return of 3.5% – hardly a bonanza! They employ 25,000 people. Chris Hughes, Facebook co-founder believes Facebook's influence it a threat to democracy, and should be broken up.

In March 2019 Zuckerberg announced they were building a "privacy-focused platform" around WhatsApp, Instagram and Messenger. Communication would supposedly be encrypted so even Facebook could not read it. If you believe that, then I have a bridge to sell you!

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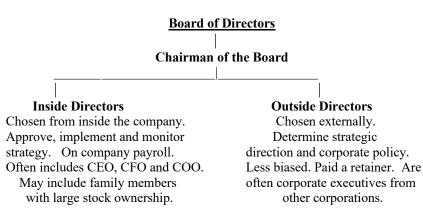
## Appendix I. CORPORATE STRUCTURES

There are four types of business ownership in America:

- 1. Sole Proprietorship. This is not a legal entity. It refers to a person or a husband and wife who own a business and are responsible for its debts e.g. Mama's Pizza.
- 2. Partnership. This is when two or more people share ownership and responsibility for management of a business e.g. a Walk-In-Clinic owned equally by three physicians.
- 3. LLC or Limited Liability Corporation. This is a private company in which people are not liable for the company's debts e.g. an office building set up as an LLC, owned by one person, or equally by three people. This protects the owners from suits.
- 4. A corporation. This is a legal entity which is separate and distinct from the owners. Like an individual, a corporation can enter into contracts, loans, suits, ownership transfer, hire and fire people, etc. The corporation is owned by stockholders to whom shares are issued. A corporation must have at least a board of directors, a President, Vice President, and Secretary. I had a professional corporation as a physician. I was the President, and Secretary, and my wife was the Vice-President.

Antebellum America did not trust corporations. Most businesses were partnerships and sole proprietorships. Businesses had to get corporate charters in each state on an individual basis. In 1848, New York State was the first to allow businesses to incorporate without individual charter applications. Other states followed.

A publicly owned corporation has shareholders who own the company, and who elect a Board of Directors who represent the shareholder interests and supervise management. The Board of Directors hire the management team, who direct the employees. The management and board of directors are called officers (in contrast to the employees).

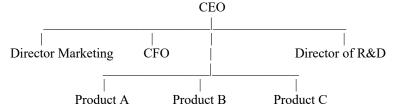


### **Management Team CEO (Chief Executive Officer)** Top manager, reports to Board of Directors. Often President of the company as well Often on Board of Directors as an inside director COO **CFO** Other Other **Others** Chief Chief Director of Director e.g. Human Operating Financial Marketing of IT (CIO) Resources Officer Officer LOWER L E V E L M A N A G E R S EMPLOYEES

The COO is more hands on than the CEO. Those directly under the CEO are often also called Vice Presidents. The CFO is often a Senior Vice President.

There are four types of organizational structure:

- 1. Functional, as in the above management team
- 2. **Divisional** e.g. North American, South American, Asian, and European, or a separate division for each product group.
- 3. **Matrix** e.g. four products each with their own marketing, HR, and finance departments all reporting to a Director of Marketing, Director of HR, and CFO for the whole company.
- 4. Hybrid e.g.



## Appendix II. Wealthiest People in US History

			Comparator 1	Comparator 1	Comparator 2	Comparator 2	Comparator 3	Comparator 3	Comparator 4	Comparator 4
		Millions	Multiplier	Millions	Multiplier	Millions	Multiplier	Millions	Fraction	Millions
Name	Date of net worth	Net worth at date	GDP 2017/GDP then	GDP 2017/GDP then	GDP pc 2017/GDP pc then	GDP pc 2017/GDP pc then	wage2017/ wage then	wage2017/ wage then	Fraction of GDP	Fraction of GDP
Stephen Girard	1831	\$8	663	\$4,974	754	\$5,658	540	\$4,050	0.00713	\$138,931
John Jacob Astor	1848	\$20	340	\$6,809	535	\$10,692	463	\$9,260	0.00824	\$160,560
Cornelius Vanderbilt	1877	\$105	104	\$10,870	329	\$34,576	294	\$30,870	0.01220	\$237,722
William Henry Vanderbilt	1885	\$232	69	\$16,016	292	\$67,683	270	\$62,640	0.01982	\$386,201
Andrew Carnegie	1901	\$225	6	\$8,040	206	\$46,408	231	\$51,975	0.01001	\$195,049
John D. Rockefeller	1913	\$900	27	\$23,881	147	\$132,357	162	\$145,800	0.02278	\$443,877
Henry Ford	1920	\$100	23	\$2,313	71	\$7,130	60	\$6,000	0.00112	\$21,824
Bill Gates	2017	\$85,000	1	\$85,000	1	\$85,000	1	\$85,000	0.00436	\$84,956
Jeff Bezos	2017	\$150,000	1	\$150,000	1	\$150,000	1	\$150,000	0.00770	\$150,038

There is no getting around it. People just seem to be much wealthier in modern times. Part of the reason is that in modern times productivity has increased. Thus, working wage used as a multiplier is not as great as GDP (Gross Domestic Product) per capita as a multiplier. Another skewing factor is that in colonial times and in antebellum America, the majority of the population was agrarian, and did not even use money very much. Most of their needs came from the farm. What did not, could still be bartered for without money. Federal taxes were 2 to 3% until 1913, when income taxes started. They are now around 17%. State and local taxes are on top of that.

Stephen Girard's CPI (Consumer Price Index) multiplier comes out to 29.25, obviously a very low result. I have exaggerated the working wage multiplier by using hourly working wages. Most workers until the 1920s worked ten hours a day and six days a week thus working 50% more hours a week with the resultant increase in weekly wages back then. I am surprised that wage multipliers are so close to the simple GDP multiplier. GDP per capita takes account of increased productivity, but does not tell the whole story.

There is another way of comparing individual wealth in historical times. Samuel H. Williamson, an economist and president of the website Measuring Worth, gives us a new way to think of net worth in historical terms - as a percentage of GDP. Thus, Stephen Girard's fortune in 1831 was 0.7% of US GDP at the time, and Rockefeller's fortune in 1913 was 2.3% of US GDP at the time. This is an interesting way of comparing the wealth of "gazillionaires" in US history.

Thus, you could today assess Stephen Girard's wealth as:

- 1. \$8 million
- 2. \$8 million x CPI multiplier = \$234 million
- 3. \$8 million x weekly wage multiplier = \$2.88 billion
- 4. \$8 million x hourly wage multiplier = \$4.05 billion
- 5. \$8 million x GDP per capita multiplier = \$5.658 billion
- 6. Relative share of GDP x Current GDP = \$150 billion

Accounting legerdemain allows us to view relative worth in many different ways!

We may also look back at other characters in history, like Genghis Khan, Emperor Shenzong of Song, Akbar I, Augustus Caesar and King Solomon of Israel. Many of these characters had power over many people, and lived in comparative luxury. But none of them had access to instant running hot water, air conditioning and instantaneous access to information, movies and music. None of them could fly across the globe in less than a day. None of them had access to modern medicine, public health, longevity and increased health in old age. I would argue that the middle class American of today is more fortunate than the wealthiest characters of history.

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## Appendix III. How the DJIA is calculated

The American stock market is the largest in the world. As of November 2018, the US owns 39.81% of world stocks. The size of the US stock market is \$34 trillion. The Eurozone comes in second at around 16%, then Japan at 7.76%, then China at 7.54%, then Hong Kong at 6.75%.

Of the three common stock indices in America (DJIA, S & P 500 and NASDAQ) the DJIA is the single most followed index. It is also the simplest of calculations. The Dow Jones Transport Average of 11 stocks was simply the stock price of all the stocks added together, and then divided by 11. They chose the transport average over industrial stocks as they were the real growth sector at the time. Dow Jones first published the average in 1884 in the Customer's Afternoon Letter. In 1896 they published the first DJIA of 12 stocks or "Dow Dozen".

Beginning in 1928 the DJIA expanded to 30 stocks. It is the Wall Street Journal editors who subjectively picked which large cap stock to include in the average. However, the DJIA has been sold to the Chicago Board of Trade, who now make those decisions.

In Dow's day stocks did not split. But since then many stocks have reached higher valuations. Companies' Boards of Directors have not wanted to make it difficult for small investors to buy one share. A stock valued at \$10,000 per share may put it out of reach for a small investor. So, companies tried to keep their stocks in a similar range to other industries, often below \$100. If a stock went up to \$200, often the company would do a stock split, i.e. revalue the share at \$100 and give people double the number of shares.

The DJIA needs to take account of stock splits. If a stock was \$200, and is now \$100, instead of dividing by 30, the average needs a new divisor that takes account of the fact that the stock should be \$200 not \$100. Over the years these splits add up and the divisor called the Dow divisor changes each time one of its shares has a stock split. For example: if ten companies have shares each of \$100, their index would be 100 x10 divided by 10 i.e. 100. If one of the stocks split, the total stock valuation would now be 950 not 1000, so the new divisor needs to be 9.5 not 10.

Note that the index does not take account of the size of the company, just the price of its stock. Thus, if one company is ten times the size of another, and they both have the same stock price, the larger company does not get more representation in the average. The Standard and Poor 500 Index is capitalization weighted i.e. it reflects not only the stock price but the number of shares i.e. the capitalization of the company. Therefore, a company ten times the size of another company will have ten times the effect on the index for the same increase in stock price.

The DJIA is a price weighted average. So, if one company's stock price is \$10 and it goes up \$5 that is a 50% increase, but if another company's stock price is

\$100 and it goes up \$5 the increase is 5%. But both increases would produce the same increase in the DJIA.

## Below are some statistics on approximate projected US assets, liabilities, income and spending for 2019.

<b>\$ Trillions</b>	Assets	Liabilities	Net
Individuals	96	14	82
Companies	133	99	34
Federal Government	5	17	-12
State & Local Government	nent 13	5	6
Foreign Investment	23	11	12
Total	\$270 Trillion	\$146 Trillion	\$124 Trillion

<b>All Government Incon</b>	ne Trillions 2019	All Govt Spen	ding Trillions 2019
Federal	3.4	Social Security	1.5
State	1.7	Health	1.7
Local	1.4	Education	1.1
Total	\$6.5 Trillion	Defense	1
		Welfare	0.5
Source of all Governm	ent Income	Interest	0.5
Income tax	2.4	Other	1.3
Social Security tax	1.5	<u>Total</u>	\$7.6 Trillion
Sales & Property taxes	1.6		
Fees and charges	0.6		
Business and other	0.5		
<u>Total</u>	\$6.5 Trillion		

## **Average US Household Income and expense 2017 Very Approximate**

Income		\$73,600
Expenses	Housing	\$20,000
	Estimated.Federal Tax	\$9,500
	Transport	\$9,500
	Food	\$7,700
	Local and State taxes	\$2,500
	Insurance	\$6,700
	Soc Sec/pension	\$5,600
	Healthcare	\$4,900
	Entertainment	\$3,200
	Other	\$4,000
	Total	\$73,600

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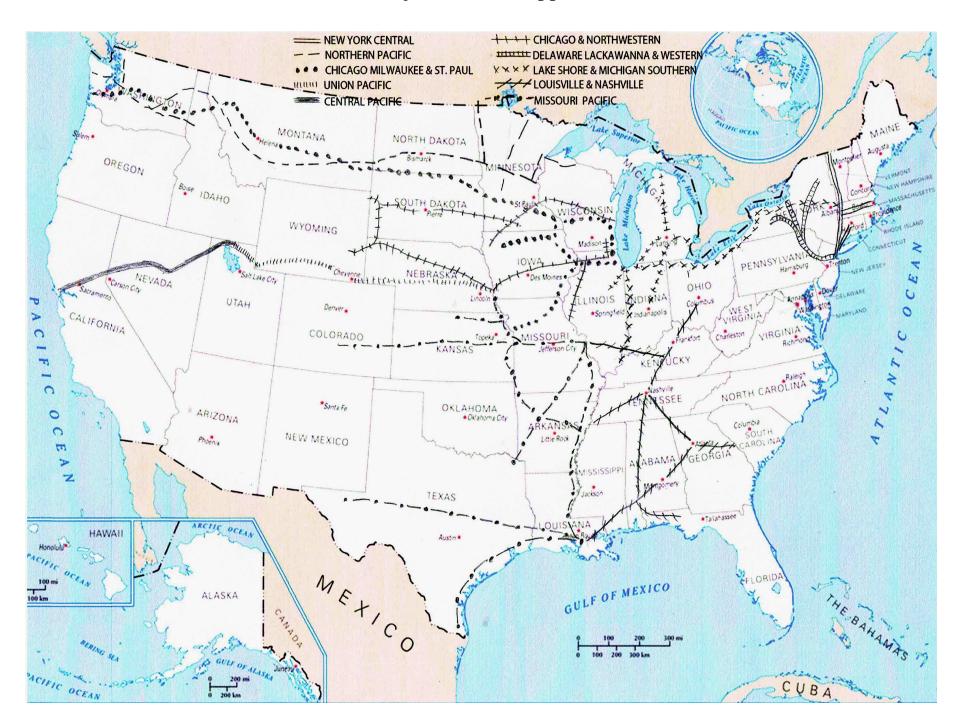
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## 1884 DJTA and Major Railroad Approximate Locations



# INDEX RR = Railroad

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Andrew Carnegie sold his steel works to JP Morgan for \$480 million in 1901. Carnegie's profit was \$225 million and Morgan paid him with 2,250 of these bonds below. On the front cover is a stock certificate of Rockefeller's and Flagler's 1875 Standard Oll Company. Rockefeller became the world's first billionaire.



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